Norlite

Comprehensive Performance Test (CPT) Plan

August 21, 2020
Revision 3 - Final

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List of Acronyms

acfm	actual cubic feet per minute
As	arsenic
APCS	air pollution control system
ASTM	American Society for Testing and Materials
AWFCO	automatic waste feed cut-off
Be	beryllium
Btu	British thermal unit
BV	Bureau Veritas Laboratories
CAA	Clean Air Act
Cd	cadmium
CEMS	continuous emissions monitoring system
cfh	cubic feet per hour
CFR	Code of Federal Regulations
Cl_2	chlorine gas
CMS	continuous monitoring system
CO	carbon monoxide
CO_2	carbon dioxide
CPT	comprehensive performance test
Cr	chromium
CVAAS	cold vapor atomic absorption spectroscopy
DCS/DAS	distributive control system / data acquisition system
DI	deionized (water)
DOC	documentation of compliance
DOT	Department of Transportation
DQOs	data quality objectives
DRE	destruction and removal efficiency
dscfm	dry standard cubic feet per minute
dscm	dry standard cubic meter
EPA	Environmental Protection Agency (U.S.)
FID	flame ionization detector
FRP	fiberglass-reinforced plastic
FSAP	feed stream analysis plan
GC/MS	gas chromatography/mass spectrometry
GCT	Gas Conditioning System
gpm	gallons per minute
gr	grains (7,000 grains = 1 pound)
gr/dscf	grains per dry standard cubic foot
g/hr	grams per hour
GSA	Gas Suspension Absorber
g/sec	grams per second

HAPs	hazardous air pollutants
HCl	hydrogen chloride (gas) or hydrochloric acid
Hg	mercury
HOCs	hazardous organic constituents
Hr	hour
HRA	hourly rolling average
HRGC/HRMS	high resolution gas chromatography / high resolution mass spectrometry
HWC	hazardous waste combustor
ICAP	inductively coupled argon plasma
ICP-MS	inductively coupled plasma mass spectrometry
ID	induced draft
lb/hr	pounds per hour
LCS	laboratory control sample
LDAR	leak detection and repair
LLGF	liquid low-grade fuel
LSC	laboratory services coordinator
LVM	low volatile metals
LWAK	lightweight aggregate kiln
MACT	maximum achievable control technology
MCB	monochlorobenzene
MDL	method detection limit
mg/kg	milligrams per kilogram
MOC	management of change
MS/MSD	matrix spike / matrix spike duplicate
MSHA	Mine Safety and Health Administration
MTEC	maximum theoretical emission concentration
NESHAPs	national emissions standards for hazardous air pollutants
ND	non-detect
NDIR	non-dispersive infrared
NIC	notice of intent to comply
NOC	Notification of Compliance
NYSDEC	New York State Department of Environmental Conservation
O&M	operation and maintenance
OPL	operating parameter limit
OTC	operator training and certification
O_2	oxygen
Pb	lead
PCBs	polychlorinated biphenyls
PCDDs	polychlorinated dibenzo-p-dioxins
PCDFs	polychlorinated dibenzofurans
PET	performance evaluation test
pg	picograms
POHC	principal organic hazardous constituent
PHA	process hazard analysis
P&ID	process and instrumentation diagram

PLC	programmable logic control
PM	particulate matter
ppm(v)	part per million (volume basis)
psia	pounds per square inch absolute
psig	pounds per square inch gauge
QAO	quality assurance officer
QAPP	quality assurance project plan
QA/QC	quality assurance/quality control
RA	rolling average
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
scfm	standard cubic feet per minute
SDS	Safety Data Sheets
S/N	signal-to-noise ratio
SOP	standard operating procedure
SRE	system removal efficiency
SSMP	startup, shutdown, and malfunction
plan SVM	semi-volatile metals
THC	total hydrocarbons
TEF	toxic equivalency factor
TEQ	toxic equivalencies
tph	tons per hour
VOST	volatile organic sampling train
WAP	waste analysis plan
w.c.	water column

1.0 Introduction

Norlite, LLC operates a lightweight aggregate manufacturing complex located in Cohoes, NY. The Norlite facility currently operates two lightweight aggregate kilns (LWAKs) that manage hazardous waste under an Air Title V Permit.

The facility recently upgraded air pollution control systems (APCS) by replacing two existing venture-based wet scrubber systems with two new semi-dry technology scrubbers employing lime as the sorbent material. This upgrade also included replacement of the Continuous Emissions Monitoring System (CEMS) associated with each kiln. These improvements are addressed in the facility's Air Title V Permit Mod 5 dated December 27, 2018.

This Comprehensive Performance Test (CPT) will serve as the initial compliance demonstration of each new APC system for each LWAK. The initial performance specification test (PST) for each new CEMS will be completed in advance of this test program.

1.1 Facility Overview

General facility information is provided below:

Owner:	Tradebe Environmental Services, LLC
Facility:	Norlite, LLC 628 S. Saratoga Street Cohoes, NY 12047
U.S. EPA ID #.	NYD 080 469 935
Facility Contact:	Mr. Prince Knight Phone No.: (518)235-0401, Ext 4049 e-mail: prince.knight@tradebe.com

The Norlite LWAKs produce an expanded shale aggregate and in the process burn liquid low-grade fuel (LLGF) as an energy source. The process is monitored and controlled by a distributive control system (DCS) capable of continuously monitoring the process to assure operational parameters are within regulatory and permit limits while waste is being fed to the unit. In addition, both kilns are equipped with a continuous emissions monitoring system (CEMS) that continuously samples the exhaust gases for oxygen and carbon monoxide concentrations in the stack gas stream. This facility handles liquid wastes that are classified as hazardous and treats process vent streams from operations at the facility pursuant to compliance with 40 CFR Part 63, Subpart DD. Because these units burn RCRA hazardous waste, they are regulated by 40 CFR Part 63, Subpart EEE: National Emission Standards for Hazardous Air Pollutants (NESHAPs) from Hazardous Waste Combustors (HWCs).

1.2 Regulatory Background and Compliance History

Regarding compliance with the maximum achievable control technology (MACT) regulations (Subpart EEE) promulgated on October 12, 2005 (see Section 1.3 below), Norlite has previously completed all preliminary notifications required by this rule. A Notice of Applicability was sent to EPA on April 9, 1999. Notice of a Public Meeting to address both the new MACT rule and the Part B renewal process was posted in the printed and broadcast media over the week of June 19, 1999. The public meeting was held on July 26, 2000 and the final notice of intent to comply (NIC) was submitted to EPA on September 8, 2000.

MACT-required compliance testing and notification of compliance (NOC) submittals have been previously conducted as shown in **Table 1-1** below:

Table 1-1 MACT Compliance Testing History

Compliance Test	Kiln Tested	NOC Submittal
Initial Comprehensive Performance Test (CPT) under the Interim Standards	Kiln 2 – March 2004 Kilns 1 & 2 – June 2004 Kiln 1 – July 2004	August 2004
Initial CPT under the Replacement Standards	Kiln 1 – October 2010 & January 2011	April 2011
Initial Confirmatory CPT	Kiln 1 – May 2013	August 2013
Second CPT under Replacement Standards	Kiln 2 – September & October 2015	January 2016
Full CPT under an EPA Administrative Order	Kiln 1 – November 2017	May 2018

1.3 Applicable MACT Performance Standards

The MACT rule for HWCs promulgated on October 12, 2005, was effective on December 12, 2005 and had a compliance date of October 14, 2008. Norlite fully complies with these regulations after having conducted their initial MACT CPT (pursuant to the Replacement Standards) in October 2010 and January 2011 which successfully demonstrated compliance with all applicable standards and performance criteria. A NOC was submitted to the regulatory agencies in April 2011. Subsequent confirmatory CPTs have been performed, as required, to document continued compliance with applicable standards. Applicable MACT performance standards as noted under 40 CFR 63.1221 are noted in **Table 1-2** below.

Table 1-2 Summary of Applicable MACT Replacement Emission Standards for LWAKs

Emissions Parameter	Limit	Citation
Destruction and Removal Efficiency (DRE)	≥99.99%	40 CFR 63.1221(c)(1)
PCDDs/PCDFs	≤0.20 ng/dscm TEQ	40 CFR 63.1221(a)(1)(i)
Total Chlorine (as HCl & Cl_2)	≤ 600 ppmv dry	40 CFR 63.1221(a)(6)
Mercury	≤ 120 μg/dscm or MTEC in excess of 120 μg/dscm	40 CFR 63.1221(a)(2)
Semivolatile Metals (SVM) (Cadmium and Lead)	≤ 250 μg/dscm and ≤ 3.0E-04 lb per MMBTU heat input*	40 CFR 63.1221(a)(3)
Low Volatile Metals (LVM) (Arsenic, Beryllium and Chromium)	≤ 110 μg/dscm and ≤ 9.5E-05 lb per MMBTU heat input*	40 CFR 63.1221(a)(4)
Carbon monoxide <u>or</u>	≤ 100 ppmv dry	40 CFR 63.1221(a)(5)(i)
Totals Hydrocarbons	≤ 20 ppmv	40 CFR 63.1221(a)(5)(ii)
Particulate Matter (PM)	≤ 0.025 gr/dscf	40 CFR 63.1221(a)(7)

* heat input from hazardous waste, 70 FR 59574, October 12, 2005

Note: All emission parameters (except DRE) are measured on a dry basis and corrected to 7% O_2.

1.4 Comprehensive Performance Test Requirements

The requirements for a MACT CPT are outlined under 40 CFR 63.1207(b)(1). Briefly, Norlite is required to:

- Demonstrate compliance with applicable emission standards while the source operates under normal operating conditions.
- Conduct a performance evaluation of all continuous monitoring systems (CMS) required for demonstration of continuous compliance with the emission standards; and
- Establish new OPLs necessitated by the recent transition to a semi-dry scrubbing Air Pollution Control (APC) system.

The following subsections provide an overview of planned activities.

1.4.1 Regulatory Pathways and Options Selected

The MACT regulations allow for a certain degree of flexibility when choosing the most appropriate means for compliance demonstration. The primary pathways (options) previously chosen by Norlite are listed below:

1) Norlite follows the provisions of 40 CFR 63.1209(l)(1)(v) and 40 CFR 63.1209(n)(2)(vii) pursuant to the establishment of metal feed rate limits through the fortification of the waste feed stream with metal constituents and performing an extrapolation. Details on the methodology that has been used during prior MACT tests is summarized in Section 5.5.1.

2) Facilities can comply with either a carbon monoxide (CO) limit or a total hydrocarbon (THC) limit. Norlite has chosen to comply with the CO limit of 100 ppm corrected to 7% oxygen.

   63.1221(a)(5)(i) states that when CO alternative is chosen, the facility must also document that, during the destruction and removal efficiency (DRE) test runs, hydrocarbons do not exceed 20 parts per million by volume during those runs, over an hourly rolling average (monitored continuously with a continuous emissions monitoring system), dry basis, corrected to 7 percent oxygen, and reported as propane.

3) Several of the MACT emission standards require an operating limit for maximum flue gas flow rate <u>or</u> maximum production rate to ensure continued compliance. Norlite has chosen to use maximum production rate (shale feed rate) as the controlling parameter for all standards.

4) Norlite's new dry scrubber Air Pollution Control (APC) system is a state-of-the-art design that can comply with all applicable Environmental Protection Agency (EPA or Agency) Maximum Achievable Control Technology (MACT) standards for Lightweight Aggregate Kilns (Subpart EEE). A combination of a maximum chlorine feed rate and injection of hydrated lime at two different locations is used to control HCl/Cl emissions.

1.4.2 Other MACT Requirements

Based on changes in plant design and operating procedures, the following plans will be updated to reflect new systems control and operating records keeping. These updated plans will be provided concurrent with the Notice of Compliance following this compliance demonstration.

- **Startup, Shutdown and Malfunction Plan (SSMP)** in accordance with 63.6(e)(3) and 63.1206(c)(2)(ii)(B).
- **Operation and Maintenance Plan (O&M Plan)** in accordance with 63.1206(c)(7).
- **CMS Quality Control (QC) Program Plan** as required by 40 CFR 63.8(e).
- **Feed Stream Analysis Plan (FSAP)** as a replacement Air FAP
- **Operator Training and Certification Program** (OTC Program) as required by 40 CFR 63.1206(c)(6).

Note: The CMS must be finalized to conduct the required pre-CPT audits. The final CMS Plan will be submitted with the NOC and the internal audits will remain on site for review.

1.4.3 Test Program Overview

This CPT Plan describes how Norlite intends to conduct performance testing for both regulated HWC units at its Cohoes, NY facility. Testing will be conducted to demonstrate that the regulated units continue to comply with all applicable emission standards.

Norlite plans to initiate the performance test during the week of **October 26, 2020**. The testing will be conducted under **two (2) sets of operating conditions** per unit as described subsequently in Section 2.0. Three (3) sampling runs will be completed for each test condition. The tests to be conducted are summarized below in **Table 1-3**.

Table 1-3 Overview of Stack Test Requirements

Test Parameter	Sampling Method	Analytical Method(s)
PCDDs/PCDFs	EPA Method 0023A	EPA Method 0023A
Mercury	EPA Method 29	EPA Method 29
SVM & LVM	EPA Method 29	EPA Method 29
Hydrogen Chloride and Chlorine	EPA Method 5/26A	EPA Method 26A
Particulate Matter	EPA Method 5/26A	EPA Method 5
CO and O_2	Facility CEMS	Facility CEMS
THC	EPA Methods 25A/18	EPA Methods 25A/18
MCB for DRE	EPA Method 0030 (VOST)	EPA Method 0030
Flow and Moisture	EPA Methods 2 & 4	EPA Methods 2 & 4

1.4.4 Comprehensive Performance Test Plan

The requirements for a CPT Plan under MACT are outlined under the General Provisions, 40 CFR 63.7(c)(2)(i), and in 40 CFR 63.1207(f)(1). These requirements are summarized in **Table 1-4** which indicates where the item can be found within the body of this document.

Table 1-4 Cross Reference of CPT Requirements

Topic	Regulatory Citation	Section in CPT Plan
Program Summary	40 CFR 63.1207(f) and 63.7(c)(2)(i)	1.0
Data Quality Objectives (DQOs)	40 CFR 63.1207(f) and 63.7(c)(2)(i)	App. A, Sect 3.0
Internal and External Quality Assurance Plan	40 CFR 63.1207(f) and 63.7(c)(2)(i)	App. A, Sect 14.0
Analysis of Feed Streams (as fired)	40 CFR 63.1207(f)(1)(i)	3.0
Identification of HAPs in Feed Streams and Description of Waste handling and blending Operations	40 CFR 63.1207(f)(1)(ii)	3.2
Detailed Engineering Description of Combustor	40 CFR 63.1207(f)(1)(iii)	4.0
Description of Sampling and Monitoring Procedures	40 CFR 63.1207(f)(1)(iv)	6.0 & App. A
Detailed Test Schedule	40 CFR 63.1207(f), (f)(1)(v) and 63.7(c)(2)(i)	5.6
Detailed Test Protocol	40 CFR 63.1207(f)(1)(vi)	5.0
Description of Planned Operating Conditions	40 CFR 63.1207(f)(1)(vii)	5.2
Procedures for Rapidly Stopping Hazardous Waste…	40 CFR 63.1207(f)(1)(viii)	4.2.6
Determination of Hazardous Waste Residence Time	40 CFR 63.1207(f)(1)(ix)	4.1.4
Metal Feed Rate Limit Extrapolation (if used)	40 CFR 63.1207(f)(1)(x)	5.5.1.2
Documentation of Expected Levels of Regulated Constituents in Other Feed Streams that are not	40 CFR 63.1207(f)(1)(xi)	3.3.3
Documentation of Conditioning Time Needed to Reach Steady State Operation Prior to Testing	40 CFR 63.1207(f)(1)(xii)	5.4.2
Cement Kilns with in-line Raw Mills…..	40 CFR 63.1207(f)(1)(xiii)	N/A
Cement Kilns with Dual Stacks….	40 CFR 63.1207(f)(1)(xiv)	N/A
Request to use Method 23 for PCDDs/PCDFs	40 CFR 63.1207(f)(1)(xv)	N/A
Documentation of MTEC Levels for HCl/Cl_2	40 CFR 63.1207(f)(1)(xvi)	N/A
Surrogate for Monitoring Gas Flow rate	40 CFR 63.1207(f)(1)(xvii)	1.4.1
Alternative Monitoring Requests under 63.1209(g)(1)	40 CFR 63.1207(f)(1)(xviii)	N/A
Documentation of Temperature Measurement Location	40 CFR 63.1207(f)(1)(xix)	4.1.3
Documentation for Sources Using Carbon Injection	40 CFR 63.1207(f)(1)(xx)	N/A
Documentation for Sources Using Carbon Beds	40 CFR 63.1207(f)(1)(xxi)	N/A
Documentation for Sources Using D/F Inhibitors	40 CFR 63.1207(f)(1)(xxii)	N/A
Sources Performing Manual Sampling for Scrubber Solids	40 CFR 63.1207(f)(1)(xxiii)	N/A
Sources Equipped with Other PM Control Devices	40 CFR 63.1207(f)(1)(xxiv)	N/A
Sources Using Dry Scrubbers for HCl/Cl_2 Control	40 CFR 63.1207(f)(1)(xxv)	2.2.1.9
Handling of non-detect values in waste feed streams…	40 CFR 63.1207(f)(1)(xxvi)	App. A, Sect 3.3 and 13.4.4
Such other information as the Administrator reasonably finds necessary to determine whether to approve the performance test plan.	40 CFR 63.1207(f)(1)(xxvii)	N/A
Use of Data Compression Techniques for CMS	40 CFR 63.1211(e)	N/A
CMS and CEMS performance evaluation test plan	40 CFR 63.8(e)(4) and 1207(b)(1)	App. B

1.4.5 Notification of Compliance

As noted previously, Norlite plans to initiate the CPT during the week of **October 26, 2020** and submit the NOC within 90 days of completing the test program. Further details on the types of information to be provided in the NOC are given in **Section 7.0**.

1.5 Document Organization

This CPT Plan is organized to provide the information required in 40 CFR 63.1207(f)(2). This section has presented an overview of the facility in terms of regulatory background, compliance history, applicable performance standards, MACT rule integration issues and overview of the planned test program. **Section 2.0** provides a detailed discussion of the operating levels that LWAK 1 & 2 will operate under to ensure a valid test and certify compliance with the emission standards. **Section 3.0** describes the chemical and physical characteristics for the hazardous liquid and non-hazardous shale feed stream fed to the regulated units. **Section 4.0** provides a technical engineering description of the combustion units and the auxiliary systems, including process monitoring instrumentation. **Section 5.0** describes the test protocols, planned operating conditions and test schedule. **Section 6.0** provides an overview of the waste liquid, shale and stack gas sampling and analysis program and **Section 7.0** provides a discussion of the final report / NOC format for the program. A Quality Assurance Project Plan is in **Appendix A**.

2.0 System Operating Parameters

2.1 Operating Parameters Overview

The OPLs currently in place at Norlite are waived for the purposes of conducting all CPTs following the initial CPT as per 40 CFR 63.1207(h)(1). Norlite intends to use the results of this test program to establish new limits for all parameters.

The OPLs discussed below are based on the provisions of the HWC MACT regulations in 40 CFR 63 Subpart EEE. Most of the parameters result from the operating and monitoring data demonstrated during the CPT. However, several limits are based on regulatory guidance, manufacturer's recommendations, and/or good operating practice.

Table 2-1 provides an overview of the specific OPLs required, the applicable regulatory citation and the MACT performance standard with which each specific OPL ensures compliance. **Table 2-2** provides a summary of the LWAK Combustion Systems limits established during the **CPT performed at Norlite in 2017** along with the measurement basis and the way the OPL limit will be determined from the test results. Current Air Pollution Control System OPLs are provided in **Table 2-3**.

Table 2-1 MACT Operating Parameter Matrix Applicable to LWAKs

Process Parameter	Regulatory Citation	Ensures Compliance with these MACT Performance Standards
Maximum Total (and Pumpable) Hazardous Waste Feed Rate	63.1209(j)(3) and 63.1209(k)(4)	DRE and PCDDs/PCDFs
Minimum Combustion Chamber Temperature	63.1209(j)(1) and 63.1209(k)(2)	DRE and PCDDs/PCDFs
Maximum Production Rate	63.1209(j)(2); 63.1209(k)(3); 63.1209(m)(2); 63.1209(n)(5) and 63.1209(o)(2)	DRE, PCDDs/PCDFs, PM, SVM, LVM and HCl/Cl_2
OPLs that ensure good operation of the waste firing system (i.e., minimum waste feed atomization pressure)	63.1209(j)(4)	DRE
Maximum Heat Exchanger Exit Temperature	63.1209(k)(1)	PCDDs/PCDFs
Maximum Inlet Temperature to a Dry PM Control Device	63.1209(n)(1)	SVM and LVM
PM Control Device Limits	63.1209(n)(3)	SVM and LVM
Dry Scrubber Control Device Limits	63.1209(o)(4)	HCl/Cl_2
Maximum Total Mercury Feed Rate	63.1209(l)(1)	Hg
Maximum Total SVM Feed Rate	63.1209(n)(2)	SVM
Maximum Total LVM Feed Rate	63.1209(n)(2)	LVM
Maximum Total Chlorine Feed Rate	63.1209(n)(4) and 63.1209(o)(1)	SVM, LVM and HCl/Cl_2

Table 2-2 Kiln 1 2017 CPT MACT OPLs for the Norlite LWAK Combustion Systems

Process Parameter	Units	Avg. Period (a)	How Limit Established	Current Limit (b)
Maximum Total (and Pumpable) Hazardous Waste Feed Rate	gpm	1-hr (HRA)	Avg. of **max. HRA** for each run	10.5
Minimum LLGF Feed Atomization Pressure	psig	1-hr (HRA)	Manufacturer's recommendation	35.9
Minimum Kiln Back-end Temperature	°F	1-hr (HRA)	Avg. of the test run averages	866
Maximum Heat Exchanger Exit Temperature	°F	1-hr (HRA)	Avg. of the test run averages	453
Maximum Kiln Production Rate (Shale Feed Rate)	tph	1-hr (HRA)	Avg. of **max. HRA** for each run	24.3
Maximum Total Chlorine Feed Rate	lb/hr	12-hr (RA)	Avg. of the test run averages	92.6
Maximum Total Mercury Feed Rate	lb/hr	12-hr (RA)	Metals Extrapolation	0.007
Maximum Total LVM (As, Be & Cr) Feed Rate	lb/hr	12-hr (RA)	Metals Extrapolation	4.0
Maximum Total Pumpable LVM (As, Be & Cr) Feed Rate	lb/hr	12-hr (RA)	Metals Extrapolation	3.72
Maximum Total SVM (Cd & Pb) Feed Rate	lb/hr	12-hr (RA)	Metals Extrapolation	5.8
Maximum CO concentration corrected to 7% oxygen	ppm	1-hr (HRA)	Regulatory Citation	100

Notes:

(a) HRA = hourly rolling average; RA = rolling average

(b) Limits that were established during the Kiln 1 CPT – Actual "Current" Norlite Limits have been established with NYS DEC and included in the current Title V permit.

Table 2-3 CPT MACT OPLs for the LWAK Air Pollution Control Systems

Process Parameter	Units	Avg. Period (a)	How Limit Established	Current Limit
Total Baghouse / GSA Lime Feed Rate	lbs/hr	1-hr (HRA)	Average of test run averages	209
Total Baghouse / GSA Carrier Fluid Feed Rate	scfm	1-hr (HRA)	Average of test run averages	180
Flue gas temperature – cyclone inlet	Deg C	1-hr (HRA)	Average of test run averages	NA
Flue gas temperature – GCT outlet	Deg C	1-hr (HRA)	Average of test run averages	NA
Maximum Baghouse Inlet Temperature	Deg C	1-hr (HRA)	Average of test run averages	NA

Notes:

(a) HRA = hourly rolling average; RA = rolling average

2.2 Establishment of Operating Parameter Limits

The permit limits for each of the control parameters are established as specified in the HWC MACT regulations given in 40 CFR 63.1209. The following sections describe how each control parameter limit is established.

2.2.1 Parameters Demonstrated During the CPT

2.2.1.1 Maximum Total Hazardous Waste Feed Rate [40 CFR 63.1209(j)(3) and (k)(4)]

The maximum total hazardous waste feed rate operating limit is established for maintaining compliance with the DRE and dioxin/furan emission standards. Since Norlite feeds only a single hazardous waste liquid stream to the combustor, total hazardous waste feed rate and total pumpable hazardous waste feed rate are the same. The limit is established as an HRA limit from the average of the maximum HRAs demonstrated during the CPT.

2.2.1.2 Maximum Total Metal Feed Rates [40 CFR 63.1209(l)(1) and (n)(2)]

The maximum metal feed rate operating limits are established to maintain compliance with the mercury, SVM and LVM emission standards. Because the waste normally treated in the combustor contains varying levels of native regulated metals, Norlite plans to fortify the LLGF feed tank with metal solutions designed to raise the metal concentrations. The metal feed rate limit for each constituent is then determined by extrapolation using the system removal efficiency (SRE) for each surrogate metal. The calculated feed rate limit for mercury, LVM and SVM is expressed as a 12-hour RA. The maximum total metal feed rates include the target metals introduced in the shale feed.

2.2.1.3 Maximum Total Pumpable LVM Feed Rate [40 CFR 63.1209(n)(2)(vi)]

A separate limitation on maximum pumpable LVM feed rate will be calculated to include metals introduced by the LLGF.

2.2.1.4 Maximum Total Chlorine Feed Rate [40 CFR 63.1209(n)(4) and (o)(1)]

The maximum total chlorine/chloride feed rate operating limit is established to maintain compliance with the SVM, LVM, and HCl/Cl_2 emission standards. The total feed rate of chlorine/chloride is monitored on a continuous basis by knowing the concentration in the LLGF and shale feed streams. The calculated total chloride feed rate limit is expressed as a 12-hour RA.

2.2.1.5 Minimum Kiln Back-End Temperature [40 CFR 63.1209(j)(1) and (k)(2)]

The minimum kiln back-end temperature operating limit is established for maintaining compliance with the DRE and dioxin/furan emission standards. Kiln temperature is monitored on a continuous basis and the limit for the combustor is established as an hourly rolling average (HRA) equal to the average of the test run average values.

2.2.1.6 Maximum Heat Exchanger Exit Temperature [40 CFR 63.1209(k)(1)(ii)]

The maximum heat exchanger exit temperature operating limit is established for maintaining compliance with the dioxin/furan emission standard. The heat exchanger exit temperature is monitored on an HRA basis and the operating limit is established as the average of the test run averages observed during the CPT.

2.2.1.7 Maximum Kiln Production Rate (Shale Feed Rate) [40 CFR 63.1209(j)(2), (k)(3), (m)(2), (n)(5), (o)(2)]

The maximum kiln production rate operating limit is established for maintaining compliance with the DRE, dioxin/furan, mercury, PM, LVM/SVM, and HCl/Cl_2 emission standards. Maximum kiln production rate (shale feed rate) is established as an appropriate surrogate for gas residence time in the combustion chamber and is monitored on an HRA basis. The maximum kiln production rate is established as the average of the <u>maximum</u> HRAs observed during the CPT.

2.2.1.8 Maximum Baghouse Inlet Temperature [40 CFR 63.1209(n)(1)]

The maximum baghouse inlet temperature operating limit is established for maintaining compliance with the SVM and LVM emission standards. The baghouse inlet temperature is monitored on a continuous basis. The maximum baghouse inlet temperature limit for the combustor is established as an HRA equal to the average of the test run averages during the CPT.

2.2.1.9 Minimum Limits for Dry Scrubber Operating Variables [40 CFR 63.1209(o)(4)]

Minimum operating limits for Norlite's dry scrubbing system include dry sorbent (lime) feed rate and dry sorbent carrier fluid flow rate. These parameters are monitored on a continuous basis to ensure compliance with the HCl/Cl_2 emission standards. The operating limits for each parameter are established as the average of the test run averages observed during the CPT.

2.2.2 Parameters Established by Regulatory Requirements

2.2.2.1 Maximum Stack Gas CO Concentration [40 CFR 63.1203(b)(5)(i)]

The maximum hourly rolling average stack gas CO concentration will be maintained at or below 100 ppmv corrected to 7% oxygen (dry basis) during the CPT and at all other times when firing hazardous waste.

2.2.3 Parameters Established by Manufacturer's Recommendations, Operational Safety, and/or Good Operating Practice

2.2.3.1 Fugitive Emissions Control [40 CFR 63.1206(c)(5)(i)(A), 63.1209(p)]

Norlite's LWAK units are sealed systems operating under negative pressure. Daily inspections are performed to ensure that fugitive emissions do not occur. Corrective actions taken in such an event will be described in the SSMP developed and submitted as part of NOC.

2.2.3.2 Operation of Waste Firing System [40 CFR 63.1209(j)(4)]

This regulation stipulates that facilities should specify operating limits to ensure that good operation of the firing system is maintained to ensure compliance with the DRE standard. To satisfy this requirement, Norlite previously established a minimum waste feed atomization pressure during the initial CPT. The minimum atomization pressure limit for the combustor is established based on the manufacturer's recommendation and as an HRA equal to the average of the test run averages for the CPT. A new minimum waste atomization pressure will be established during the DRE compliance demonstration.

3.0 Description of Kiln Feed Materials

This section describes the hazardous waste liquid and non-hazardous streams fed to the LWAKs at the Norlite facility. Any hazardous air pollutants (HAPs) listed in Section 112(b) and other non-hazardous constituents expected in these streams are also identified. Storage and delivery of the feed streams to the HWC units are described in **Section 4.0**.

3.1 General Overview

This section provides a description of the primary RCRA hazardous waste streams that are managed within the Norlite facility. Other non-hazardous feed materials are also described.

The waste feed materials handled by the facility cover a wide range of waste codes and hazardous constituents. Because of the potential wide range in materials handled, Norlite does not normally analyze the feed materials for HAPs as defined by Section 112 of the Clean Air Act. However, review of the HAPs list indicates that 50 HAPs could be present in the LLGF material. These compounds are identified in **Table 3-1**. Further information relative to the properties and characteristics of the kiln feed materials processed is provided in the following sections.

3.2 Hazardous Waste Feed Stream

3.2.1 Liquid Low-Grade Fuel

LLGF is injected countercurrent to the product flow through the kiln through burners at the discharge (front) end of the kiln. A micromotion coriolis flow meter is used to continuously monitor the fuel usage rate. LLGF is maintained in nitrogen-blanketed storage tanks and is delivered to the kiln through a pumping station to maintain an approximate maximum feed rate of 10.5 gpm to each burner. The burner consists of a stainless-steel outer pipe that supplies atomization air or steam and a 1-inch diameter carbon steel inner pipe. This burner uses high-pressure air or steam atomization to inject the material directly into the combustion zone. The LLGF burner is rated at 10.5 gpm at 35 psi line pressure and is monitored continuously.

LLGF consists of organic substances and mixtures immediately useful as fuel. Typical generic types of organic substances that may be present in LLGF at some level at any given time include:

Alcohols
Glycols
Polyols
Glycol Ethers
Ketones
Esters
Phenolics
Hydrocarbons
Ethers
Oxides & Epoxides
Petroleum Oils & Derivatives
Vegetable Oils & Derivatives

Degreasers
Chlorinated Organic Liquids
Polymers, Copolymers,
 Oligomers and Resin Fragments to include:
 Epoxies
 Aldehydes
 Acrylics
 Urethanes
 Polyethylenes
 Polypropylenes
 Styrenes
 Vinyls

Table 3-1 HAPs Potentially Present in LLGF

CAS #	Compound	CAS #	Compound
75058	Acetonitrile	1634044	Methyl tert butyl ether
107131	Acrylonitrile	75092	Methylene chloride (Dichloromethane)
71432	Benzene (including benzene from gasoline)	91203	Naphthalene
117817	Bis(2-ethylhexyl)phthalate (DEHP)	108952	Phenol
56235	Carbon tetrachloride	100425	Styrene
108907	Chlorobenzene	127184	Tetrachloroethylene (Perchloroethylene)
67663	Chloroform	108883	Toluene
1319773	Cresols/Cresylic acid (isomers and mixture)	79005	1,1,2-Trichloroethane
95487	o-Cresol	79016	Trichloroethylene
108394	m-Cresol	108054	Vinyl acetate
106445	p-Cresol	75014	Vinyl chloride
106467	1,4-Dichlorobenzene(p)	1330207	Xylenes (isomers and mixture)
140885	Ethyl acrylate	95476	o-Xylenes
100414	Ethyl benzene	108383	m-Xylenes
107062	Ethylene dichloride (1,2-Dichloroethane)	106423	p-Xylenes
107211	Ethylene glycol	N/A	Antimony Compounds
50000	Formaldehyde	N/A	Arsenic Compounds (inorganic including arsine)
110543	Hexane	N/A	Beryllium Compounds
302012	Hydrazine	N/A	Cadmium Compounds
67561	Methanol	N/A	Chromium Compounds
74873	Methyl chloride (Chloromethane)	N/A	Glycol ethers
71556	Methyl chloroform (1,1,1-Trichloroethane)	N/A	Lead Compounds
78933	Methyl ethyl ketone (2-Butanone)	N/A	Nickel Compounds
108101	Methyl isobutyl ketone (Hexone)	N/A	Polycyclic Organic Matter
80626	Methyl methacrylate	N/A	Selenium Compounds

Note: Data derived from detailed review of waste profile streams, waste analysis data and Norlite industrial chemical survey.

The above list is descriptive and not considered limiting. The substances contained in LLGF are typically those used each day in industry, commerce and around the home. They are found in products such as paints, varnishes, lacquers, thinners, cleaners, detergent formulations, spot removers, nail polish remover, lighter fluid and gasoline. Expected ranges for MACT-regulated parameters in the LLGF are shown in **Table 3-2**. Metal concentrations can exceed the values shown in **Table 3-2**, provided the feed is from agitated tanks and provided that the LLGF feed rate is reduced proportionately to compensate for the higher metals concentration and thereby reduce the net metal feed rate to comply with the mass feed limits in the Sampling and Analysis Plan. Norlite does not use as LLGF any substances or mixtures of polychlorinated biphenyls (PCBs) subject to NYCRR regulations pursuant to Part 371 or Federal PCB regulations pursuant to 40 CFR Part 761. Norlite does not accept waste streams of greater than or equal to 25 ppm total PCBs and is required to notify NYSDEC of any shipment received with a concentration greater than 10 ppm total PCBs within 24 hours of receipt of analytical results. The contents of streams vary greatly on a daily basis. Typical ranges of analyses for separate LLGF streams are shown in **Table 3-3**. Additional data for hazardous constituents in LLGF are provided in **Table 3-4**.

Table 3-2 Typical LLGF Feed Properties

Parameter	Units	Expected Range
Arsenic	mg/kg	0.5-0.7
Beryllium	mg/kg	< 0.2
Chromium	mg/kg	7.1-52.0
Cadmium	mg/kg	0.5-1.6
Lead	mg/kg	30.8-82.4
Mercury	mg/kg	< 0.04
Heat Content	Btu/lb	3,200-11,000
Density	g/cc	0.88-0.94
Total Chlorine	% wt.	0.04-2.6
Ash Content	% wt.	0.5-2.1

Note: Data derived from detailed review of waste profile streams, waste analysis data and Norlite industrial chemical survey.

Norlite will have two full inside tanks, most likely 100C and 200C, for this testing program. The final composition of the fuel will be determined in the month prior to the test but will be a mixture of chlorinated and non-chlorinated solvents, industrial oils and emulsions, and tank cleaning material. The target heat content range will be 8,000 to 9,000 Btu/lb with sufficient metals and chlorine content to meet the CPT Plan targets.

Table 3-3 Typical LLGF Analyses for Compound Classes

Compound	Concentration Range, % wt.
Chlorinated solvents (Trichloroethane, Trichloroethene, Tetrachloroethylene, Methylene Chloride, Monochlorobenzene and Tetrachloromethane)	0 – 4%
Alcohols (Methanol, Ethanol, Propanol, Butanol, and Isopropyl alcohol)	0 – 20%
Ketones (Methyl Ethyl Ketone, Methyl Isobutyl Ketone, Acetone and Cyclopentanone)	0 – 15%
Aldehydes (Formaldehyde, Butyl Aldehyde and Acetaldehyde)	0 – 0.5%
Petroleum Oils (Fuel oils, Hydraulic oils and Cutting oils)	0 – 25%
Acetates (Ethyl acetate, methyl acetate, Butyl acetate and Vinyl acetate)	0 – 25%
Phenol	0 – 5%
Aromatic Compounds (Benzene, Toluene, Xylenes and Naphthalene)	0 – 25%
Aliphatic Compounds (Hexane, Heptane and Pentane)	0 – 25%
Coal Tars	0 – 25%
Fatty Acids	0 – 5%
Waste Oils	0 – 15%
PCBs **(a)**	< 25 ppm
Organic Halogens	< 5%

Note: Data derived from detailed review of waste profile streams, waste analysis data and Norlite industrial chemical survey.

(a) As stated in Sections 3.2.1 and 3.2.2, the PCB limits of the permit are < 25 ppm, with notification to NYSDEC if the waste fuel received has > 10 ppm total PCBs.

Table 3-4 Representative Data for LLGF Hazardous Constituents

Compound (Common Name)	Formula	Molecular Weight	Heat of Combustion (kcal/g)	Boiling Point (°C)	Fraction of LLGF (% wt.)
Carbon Tetrachloride	CCl_4	153.8	0.24	76.7	<3%
Tetrachloroethylene	C_2Cl_4	165.8	1.19	121.1	<3%
Trichloroethene	C_2HCl_3	131.4	1.74	86.7	<3%
1,1,1-Trichloroethane	CH_3CCl_3	133.4	1.99	74.0	<3%
Monochlorobenzene	C_6H_5Cl	112.56	6.60	132.2	<3%
Formaldehyde	HCHO	30	4.47	-19	<0.5%
Phenol	C_6H_5OH	94.11	7.78	181.7	<5%
Methyl Ethyl Ketone	$CH_3COCH_2CH_3$	72.11	8.07	79.4	<15%
Naphthalene	$ClOH_8$	128.17	9.62	217.8	<25%
Benzene	C_6H_6	78.11	10.03	80.0	<25%
Toluene	$C_6H_5CH_3$	92.14	10.14	110.6	<25%

Note: Data derived from detailed review of waste profile streams, waste analysis data and Norlite industrial chemical survey.

3.3 Non-Hazardous Waste Feed Streams

3.3.1 Solid Feed Materials

The only solid material fed to the kilns is the raw shale from the onsite quarry. No solid waste materials are processed. Shale is proportioned and stored onsite and then fed directly to the kiln. The shale is introduced at the back end of the kiln (countercurrent to the waste fuels that are fed from the opposite end) through a rotary valve in order to prevent fugitive emissions and maintain heat balance in the kiln. The shale travels down the kiln in about forty (40) minutes while it dries and expands to become the raw clinker. Norlite monitors the feed rate using a FLSmidth Pfister SLF belt weigh feeder. The feeder consists of a circulating driven conveyor belt in which the load is weighted consistently by a measuring device. At the same time a speed recorder tracks the speed of the belt. The controller calculates the required belt speed to achieve the specified feed rate set point.

Representative analytical data for the shale is provided in **Table 3-5**.

Table 3-5 Typical Shale Properties

Parameter	Units	Expected Range
Arsenic	mg/kg	3.6-13.7
Beryllium	mg/kg	0.6-0.9
Chromium	mg/kg	22.9-47.4
Cadmium	mg/kg	4.3-6.2
Lead	mg/kg	23.4-32.9
Mercury	mg/kg	0.24-0.50
Total Chlorine	% wt.	0.002-0.05

Note: Data derived from detailed review of waste profile streams, waste analysis data and Norlite industrial chemical survey.

3.3.2 Used Oil

Norlite uses non-hazardous waste fuels that can be defined as used oil under 40 CFR 279 and 6 NYCRR 374-2. This fuel is used to supplement the hazardous waste LLGF in operating the kilns. Used oil is classified as either specification used oil fuel or off-specification used oil fuel. All used oil fed to the kilns is analyzed as per Norlite's Waste Analysis Plan (WAP) to provide the required information. The data is used to calculate total liquid feed input to the kilns and based on the feed rate which is meter measured as it enters the burn zone. Specification used oil fuel is defined as used oil meeting the criteria listed below in **Table 3-6**.

Table 3-6 Specification Used Oil Fuel Limits

Parameter	Limitation
Arsenic	< 5 ppm
Cadmium	< 2 ppm
Chromium	< 10 ppm
Lead	< 100 ppm
Flash Point	> 100°F
Total Halogens	< 4,000 ppm *
PCBs	< 2 ppm
* any used oil containing greater than 1,000 ppm total halogens is considered a hazardous waste because it is presumed to be mixed with listed hazardous waste. This presumption may be rebutted by demonstrating that the used oil does not contain listed hazardous waste constituents pursuant to 40 CFR 279.10(b)(ii) and 6 NYCRR 374-2.2(a)(i).	

Used oil that does not meet this specification is considered off-specification used oil fuel. Norlite uses specification used oil fuel for startup and shutdown of the kilns and any time the units are not operating under the Part 373 permit parameters (e.g. after an automatic waste feed cutoff or AWFCO). This fuel is considered equivalent to virgin fuel oils and may be used in place of virgin fuels as they are described in the permit. Off-Spec used oil is defined as any waste oil, fuel oil or mixture of these to be burned which contains between 25 and 250 parts per million (by weight) lead and which meets the limitations of Table 1 of section 225-2.5 [**see Table 3-7 below**] of this Subpart and does not contain chemical waste. As stated in Section 3.2.1, the PCB limits of the permit are < 25 ppm, with notification to NYSDEC if the waste fuel received has > 10 ppm total PCBs.

Table 3-7 Off-Spec Used Oil Limitations

Constituent / Property	Allowable
PCBs	< 50 ppm *
Total Halogens	1,000 ppm * maximum
Sulfur	See Subpart 225-1 for fuel sulfur limitations
Lead	250 ppm * maximum
Gross Heat Content	125,000 Btu/gal minimum
* parts per million by weight (water free basis) of fuel.	

Off-specification used oil fuel is not used during start up or shutdown of the kilns. It is used as the primary supplement to the hazardous waste LLGF when required by the operators. While being co-fired with the LLGF, Norlite ensures that the total metals and chlorine feed rates are not exceeded by the off specification used oil fuel. These fuels may also be used after an AWFCO provided the CO HRA is below 500 ppm.

The used oil flowrate is monitored by a micromotion Coriolis flow meter in the same manner as the LLGF.

3.3.3 Process Vent Streams

Generally, the vapors fed to the kilns consist of nitrogen gas with trace amounts of organic vapors. It is expected that the vent from the nitrogen-blanketed tanks would be primarily nitrogen with less than 2% by volume organic vapors and less than 10% oxygen. The drum processing vent stream consists of vented material from the drum handling operations. Drums are emptied via a vacuum system. The vacuum system vents to the kiln and includes general drum area vapors under negative ventilation. This vent stream is mixed with ambient air and is used as primary combustion air for the burner.

3.3.4 Supplemental Fuels

Natural gas, fuel oils or used oil is used to preheat the kiln during start-up. In cases where fuel oils or used oil is fired with LLGF, the metals content of the fuel oil is considered to comply with existing permit limits. Representative data for the fuel oil is summarized in **Table 3-8**. None of the regulated constituents would be expected to be present in natural gas.

Natural gas is also used to maintain the main burner pilot. The pilot flame nozzle is directly below the main fuel nozzle and serves to keep the main burner flame lit. The natural gas input to the kiln during the test is minor will not contribute any measurable hazardous constituents to the system. Natural gas usage is monitored via a HART Thermatel TA2 thermal mass flow meter. The meter monitors the gas flow using the thermal dispersion technology using the differential temperature and differential resistance.

The fuel oil and used oil flow meters are made by Micro Motion Coriolis mass flow meters. Flow is measured on the principle of motion mechanics.

Table 3-8 Typical Specification for Supplemental Fuel Oil

Parameter	Units	Expected Range
Arsenic	mg/kg	< 0.1
Beryllium	mg/kg	< 0.01
Chromium	mg/kg	< 0.1
Cadmium	mg/kg	< 0.1
Lead	mg/kg	< 1.0
Mercury	mg/kg	< 0.01
Heat Content	Btu/lb	> 16,000
Total Chlorine	mg/kg	< 100
Ash Content	% wt.	< 0.1

Note: Data derived from detailed review of waste profile streams, waste analysis data and Norlite industrial chemical survey.

4.0 Engineering Description of the HWC Units

This section provides a technical, engineering description of the Norlite process and associated combustion systems as well as all associated equipment and ancillary systems. A general description of the LWAK feed streams normally processed is also provided.

4.1 Combustor Design Specifications

4.1.1 General Process Overview

The Norlite facility produces an expanded shale aggregate in two dry process rotary kilns. Raw materials are quarried on-site and transported to the kiln via a conveyor system. The basic material (shale) is proportioned and stored in a silo. The raw product is introduced to the kiln at the feed (back) end from the silo, while fuels are fed from the opposite end. Calcination of the product occurs at a product temperature of 1,700°F to 2,000°F. The shale is then heated to the point of incipient fusion where it is in a semi-plastic state to expand internal gases, thereby creating voids. The cooled vitreous clinker is then discharged and stockpiled.

4.1.2 Rotary Kilns

Kiln No. 1, manufactured by Traylor, is 175 feet long. Kiln No. 2, manufactured by Allis-Chalmers, is 180 feet long. Both kilns have an outside diameter of 11 feet and consist of a steel shell lined with 6-inch refractory brick, for an effective inside diameter of 10 feet. The burn zone extends approximately 30 feet from the burner end of the kiln.

The rated capacity of each kiln is approximately 25 tons per hour (tph) clinker. Typically, 2.5×10^6 Btu are required to produce one ton of clinker at maximum capacity. In order to achieve a quality lightweight aggregate product, the kiln is normally operated at approximately 8% to 10% oxygen at the back end with carbon monoxide concentrations less than 100 ppm.

4.1.3 Location of Process Temperature Devices

Each kiln has thermocouples mounted at the kiln gas exit, gas conditioning tower exit and at the fabric filter inlet. There are also various temperature probes throughout the system for process monitoring.

4.1.4 Hazardous Waste Residence Time

The HWC MACT rule defines hazardous waste residence time as *"the time elapsed from cutoff of the flow of waste into the combustor until solid, liquid and gaseous materials from the hazardous waste exit the combustion chamber."* This is a regulatory term used to define when a unit is operating under a hazardous waste combustion mode. For the purposes of the residence time calculation for Norlite's rotary kilns, this determination is based on the gas-phase residence time since only liquid hazardous waste is burned and since the LLGF would be instantly vaporized in the kiln burning zone where temperatures range from 2,200°F to 3,000°F. The calculation of residence time is based on the kiln dimensions mentioned previously in Section 4.1.2 and actual stack gas flow rate measurements. The longest residence time for each kiln would result from the lowest flue gas flow rate and lowest kiln temperature.

Residence time will be re-calculated using CPT data.

4.2 Feed System Descriptions

Heat is supplied to each kiln by firing No's. 2, 4 or 6 fuel oil, used oil, natural gas or LLGF. All fuel is injected countercurrent to the product flow through the kiln through burners at the discharge (front) end of the kiln.

4.2.1 Liquid Waste Feeds

LLGF is maintained in nitrogen blanketed, storage tanks and is delivered to the kiln through a pumping station to maintain an approximate maximum feed rate of 10.5 gallon per minute (gpm) to the burner. The burner consists of a stainless-steel outer pipe that supplies atomization air or steam and a 1 -inch diameter carbon steel inner pipe. This burner uses high-pressure air or steam atomization to inject the material directly into the combustion zone. The LLGF burner is rated at 10.5 gpm at 35 psi line pressure and is monitored continuously with a Micromotion Coriolis flow meter.

4.2.2 Solid Feed Materials

The basic feed material is shale, which is proportioned and stored in a covered silo and then fed directly to the kiln. The shale is introduced at the back end of the kiln (countercurrent to the waste fuels that are fed from the opposite end). No solid waste materials are fed to the kiln.

4.2.3 Process Vent Streams

There are two (2) process vent streams that are sent to the kiln for incineration. The first stream is the vent from the nitrogen blanketed LLGF storage tanks. During the filling cycles of the storage tanks, any excess gaseous vapors are vented through a closed vent system to the burner end of the kiln. The second stream consists of vented material from the drum handling operations. Drums are emptied via a vacuum system. The vacuum system vents to the kiln and includes general drum area vapors under negative ventilation. This vent stream is mixed with ambient air and is used as primary combustion air for the burner.

4.2.4 Supplemental Fuels

Natural gas, fuel oils or used oil are used to preheat the kiln during start-up and may also be used as supplemental fuel while firing LLGF. Natural gas or fuel oil may also be used as a pilot when firing LLGF. Fuel oil or used oil may also be blended with LLGF when firing to increase heat content of the waste feed and improve combustion characteristics. In cases where fuel oil or used oil is fired with LLGF, the metals content of the fuel oil is considered in demonstrating compliance with condition VII(C)(6) of the Part 373 Permit.

4.2.5 Waste Handling and Blending Operations

LLGF typically has a flash point of 200°F or lower. The LLGF is not reactive but may be a toxic waste as defined in 6NYCRR Subpart §371.3(e) because the heavy metal and organic compound concentrations may exceed the limits set forth in that section. Also, LLGF may contain a characteristic corrosive waste though it no longer exhibits the characteristic.

Norlite stores the LLGF in storage tanks or in a container storage area. The tanks and containers are in a diked area. The design and operation for the tanks and containers are described in Section D, Section F (under Inspection), and Section G -- the Emergency and Contingency Plan. The LLGF, having been pre-screened, is non-corrosive to the glass-lined (Tanks 300-600) or carbon steel (Tanks 100 A, B, C and 200 A, B, C) storage tanks designed with suitable corrosion allowance. The necessary specification for the fuel has been provided to the suppliers, and has been confirmed with their LLGF Specification Sheet, and with the Norlite analysis provided prior to burning and unloading.

When preparing a tank of LLGF for burning, Norlite determines the heating value of the fuel along with the concentration of metals and total halogens. This is accomplished by 1) calculation based upon the original analysis of the fuel that makes up the tank, or 2) sampling and analysis of the tank. Each load of LLGF is sampled and analyzed upon receipt as described in Section C-5(b) of the permit. A control procedure prevents the burning of any waste until the heat content, total halogen, PCB, and metal parameters have been verified. An analysis form (WAP-2) is completed for each tank burned indicating the analyzed or calculated values for each permit parameter, the dates of analysis and/or calculation, and the date of authorization to burn the waste from the designated tank. Once the tank has been blended and certified, it will remain locked until such time that the tank is placed online with the kilns for burning. The tanks are locked with physical pad locks on the bottom and top valves and the recirculation valve. The volume of the tanks is measured using either ultrasonic or radar level gauges. These units do not require routine maintenance and are set based upon the vertical distance from the top of the tank to the bottom. They measure the distance from the top of the tank to the liquid level and calculate the percentage of the vessel that is filled with liquid. They are relatively accurate while the agitators are in operation because the top of the liquid remains fairly level.

4.2.6 Procedures for Rapidly Stopping Hazardous Waste Feed During Equipment Malfunction

Each kiln is manned on an around-the-clock basis by the burner operator from the kiln control room. The burner operator can monitor critical operating variables from the control room via a computerized data acquisition system (DAS). The burner operator in conjunction with the kiln field operator and mechanic make routine system adjustments to maintain the kiln at optimum conditions for the production of light weight aggregate while maintaining the system within the operating window as set forth by the AWFCO system.

If an AWFCO operating parameter has an excursion outside the operating window, LLGF is automatically shut off by the AWFCO system. The burner operator will switch to an alternate fuel such as natural gas or oil until corrections are made to bring the operation within the operating window.

If a non-AWFCO operating parameter has an excursion, the burner operator will attempt to make system corrections to bring the parameter within specification. Should the corrections not bring the parameter within specifications, the excursion will ultimately cause one or multiple AWFCO parameters to trigger the system to operate.

In the event of a power failure, all systems shutdown including, but not limited to, LLGF flow, fuel farm feed systems, raw shale feed, main flame, etc. All systems require manual restart. A virgin fuel is fired to bring all operating parameters within the operating window prior to commencing LLGF feed.

The main flame of the kiln is either self-sustaining or sustained by the presence of a virgin fuel pilot. Both the main flame and the pilot flame are monitored by an electronic eye to provide positive proof that a flame exists. In the event of a loss of signal by the electronic eye, the virgin fuel feed to the pilot, the main natural gas valve, the LLGF AWFCO valve, and the used oil feed valve are closed and a manual reset is required to re-establish a proof positive flame. Should operating parameters fall outside the operating window during a flame failure, a virgin fuel is fired to bring all operating parameters within the operating window prior to commencing LLGF feed.

4.3 Air Pollution Control System (APCS)

Both kilns have identical emission control systems. Both systems utilize semi-dry technology devices for the collection and removal of particulate matter, hydrogen chloride (HCl), metals and other gaseous emission products. The principal collection mechanisms are sedimentation, condensation, impaction, filtration and interception for particulate matter and metals and absorption for HCl and other gaseous species. The overall APCS also includes forced draft fans, an induced draft fan and exhaust stack, each of which is described below. It is also noted that neither kiln is equipped with any type of emergency safety vent.

4.3.1 Cyclone

Kiln emissions first pass through a mechanical collector to remove large particulate matter. The cyclone has an internal diameter of 114 inches and is refractory lined for wear and thermal protection. The cyclone is provided to remove coarse particulate matter. Dust collected in the cyclone is air conveyed to a hopper where it combines with the baghouse fines, which are added to the lightweight aggregate becoming part of the block mix product used in building materials.

4.3.2 Gas Conditioning Tower (GCT)

The kiln flue gas then passes through a gas conditioning tower. The conditioning tower uses water injection with air atomization to cool the gases. Gases enter the 118-inch diameter vessel and passes through two gas distribution screens to ensure appropriate flow through the vessel. The cooling process takes place through evaporation of the injected water. The gas enters at approximately 870°F to 1082°F and exits at 320 - 400°F. A damper provides cooling air to control temperature if the inlet temperature to the baghouse is higher than desired. The damper is under negative pressure since it is upstream of the induced draft fan
.

4.3.3 Gas Suspension Absorber (GSA)

The reactor system is comprised of an inlet bend, a venture and a riser section. The inlet bend is to ensure proper distribution of the flue gas into the venturi. In the venturi the cross section of the duct is narrowed to increase the linear flue gas velocity. The increased velocity ensures that solid material can be transported by the flue gas to create a fluidized bed in the riser section. Water and Hydrated lime, which is stored in two 60m^3 silos, are injected in the venturi and passed into the riser section. The main part of the flue gas treatment takes place in the riser section due to the intimate contact between the lime and flue gas. In this section the lime reacts with the acid constituents in the flue gases, thus capturing and neutralizing them. The large reaction surface formed by the fluidized bed increases the contact between the lime and the pollutants in the flue gas results in increased removal efficiency. Efficiency >91.5% can be achieved for HCl and SO2 within the reactor. Lime feed varies from near zero to 1,200 pounds per hour, depending upon the fuel type and feed rate.

Typical lime specifications are as follows:

- Calcium oxide – 73.6%
- Surface area – 19,500 cm^2/g
- Mean particle diameter – 1.37 µm
- Bulk density (loose / tamped) – 17.6 / 37.0 lb/ft^3

In the riser section the flue gas velocity is relatively high, and some of the solid particles are transported by the flue gas to the top of the riser section and into a second process cyclone. In the cyclone the main part of the particles is separated from the flue gas. Approximately 99% are captured, and only the smallest particles are transported by the flue gas to the Baghouse. The captured particles are returned to the reactor via a re-circulation box.

The purpose of the recirculation box is to have a buffer of reaction products with excess lime to maintain the absorption capacity and for peak temperature control purposes. The re-circulation box consists of a box with two screw conveyors. One screw conveyor at the bottom of the box for transport of solid material back into the riser section, and one screw conveyor at the top that bleeds out the spent lime and dust to a bin.

4.3.4 Fabric Filter (Baghouse)

Following the GSA is an FLS DuoClean filter (fabric filter or baghouse) with four modules and 14,467 square feet of filter area. The unit is rated for 40,792 acfm. The air cloth ratio is 2.82:1 with all four modules operating and 3.77:1 with one module offline for maintenance. 560 woven glass with PTFE membrane bags with a filtration guarantee of 10mg/Nm3 are used as the filter media. The filter media is continuously pulsed one row at a time, controlled by a timer. Hydrated lime [$Ca(OH)_2$], may be injected immediately prior to the baghouse in addition to the GSA.

Fines collected in the baghouse are discharged via a rotary air lock. The fines are combined with the cyclone fines and conveyed to one of two storage silos. Fines from both silos are added to the lightweight aggregate, becoming part of the product. The baghouse is also equipped with a bag leak detection system as required by 40 CFR 63.1206(c)(8)(ii). This system is fully certified to comply with EPA bag leak detection system guidelines of responding to mass emissions at concentrations of 1.0 mg/m3.

4.3.5 Induced and Forced Draft Fans

The baghouse is followed by a 400 HP system fan which induces draft through the kiln, cyclone, gas conditioning tower, gas suspension absorber and baghouse. The ID fan is rated at 46,827acfm.

Secondary combustion air is supplied by forced draft clinker cooler fans rated at a total of 34,495 acfm. The secondary combustion air is preheated by the clinker cooler at the front end of the kiln.

4.3.6 Exhaust Stack

The treated kiln exhaust passes to the atmosphere via a 46.5-inch diameter steel stack with a reducer to 35.5 inches at the exit point 125 feet above grade. Two access platforms are provided for stack sampling. Sample port configuration and additional details on the exhaust stack are provided in the quality assurance project plan (QAPP) located in Appendix A.

4.4 Process Monitoring and Operations

Each kiln is manned on a 24-hr basis by the burner operator. Assisting the burner operator on each shift is one kiln field operator who is responsible for activities outside of the control room. The facility has implemented an OTC Program in accordance with 40 CFR 63.1206(c)(6) and conducts operations in accordance with their O&M Plan as per 40 CFR 63.1206(c)(7). In the event of a power failure, all systems shutdown including, but not limited to, LLGF flow, fuel farm feed systems, raw shale feed, main flame, etc. All systems require a manual reset. To restart, the following must take place:

1. Pilot with virgin fuel such as natural gas.

2. Prove positive of flame.

3. Manual restart/reset of system at fuel pumping area at tank farm.

4.4.1 Burner Flame-Out

The kiln is manned around-the-clock by the burner operator who is constantly monitoring operations. Any flame-out is immediately detectable by loss of temperature on the kiln temperature recorder. The temperature within the kiln and the kiln refractory will provide sufficient heat to maintain a burn zone temperature more than 2,000°F for at least 5 minutes in the event of loss of flame. To restart after this occurrence, the same procedure previously described for a power failure must be utilized.

The main flame of the kiln is either self-sustaining or sustained by the presence of a virgin fuel pilot. Both the main flame and the pilot flame are monitored by an electronic eye to provide positive proof that a flame exists. In the event of a loss of signal by the electronic eye, the virgin fuel feed to the pilot, the main natural gas valve, the LLGF AWFCO valve, and the used oil feed valve are closed and a manual reset is required to re-establish a proof positive flame. Should operating parameters fall outside the operating window during a flame failure, a virgin fuel is fired to bring all operating parameters within the operating window prior to commencing LLGF feed.

4.4.2 Automatic Waste Feed Cut-off System

Kiln process operations are controlled from a central control room by an operator who oversees a computer-based control system. In addition to routine fail-safe features, a series of waste feed cut-offs are programmed into the control system to assure that LLGF is only fed to the kiln under prescribed conditions. This ensures that wastes are properly destroyed, and exhaust gases suitably treated before discharge to the environment. Any deviation from prescribed conditions results in immediate interruption, i.e., cut-off, of hazardous waste feed to the kiln. **Table 4-1** provides a detailed listing of all current alarm set points as well as AWFCO limits for the waste feed system to the kiln. For any other non AWFCO operational deviations, the standard operating procedure is to shut down the LLGF feed, switch to natural gas or fuel oil, define the problem and initiate corrective action. Items such as baghouse malfunction ID fan loss, etc. would be covered by this operating procedure. The loss of the ID fan would warrant the shutdown of the entire process to avoid damage to the APC system. As long as the ID fan runs, however, the kiln is maintained under negative static pressure eliminating the possibility of fugitive emissions.

4.4.3 AWFCO System Testing

Testing of the automatic waste feed cutoff system is conducted in accordance with requirements delineated in 40 CFR 264.347(c) and as outlined in Title V Permit, Condition 48. Briefly, this consists of monthly testing of the AWFCO system and all associated alarms. Permit requirements also include continuing testing performed on at least one system parameter on a random basis at least once every 7 days to verify proper operation of the control valves. Actual AWFCO events fulfill the weekly testing requirement.

4.4.4 Parameters to be Measured to Ensure Compliance with Standards

As required under the MACT rule, a variety of process parameters must be continuously monitored by the facility's CMS to ensure compliance with the emission standards. A summary of critical process instrumentation and monitoring devices is presented in **Table 4-2**. Under Subpart EEE, Norlite is required to submit a CMS performance evaluation test (PET) plan pursuant to 63.8(e)(4) and 63.1207(b)(1). The CMS PET Plan is included in **Appendix B**.

4.5 Stack Flue Gas Monitoring Equipment

Oxygen, carbon monoxide and flue gas flow rate are monitored continuously at the outlet from the baghouse and recorded digitally in the CEMS and in the kiln computers. A brief description of the stack monitoring instrumentation is provided in **Table 4-3**.

Table 4-1 Current AWFCO Operating Limits

Process Parameter	Units	Basis [a]	Current Alarm Set Point	Current AWFCO Limit
LLGF Feed Rate	gpm	HRA	9.5	> 10.5
Pumpable LLGF Feed Rate	gpm	HRA	9.5	> 10.5
Maximum Shale Feed Rate	tph	HRA	22	> 24
Minimum Back-end Temperature	°F	HRA	876	< 866
CO Concentration at the Baghouse Outlet Corrected to 7% O_2	ppm, dry basis	HRA	90	> 100
Kiln Pressure, 3 sec delay Kiln Pressure, 1 sec delay	in. w.c. in. w.c.	INST INST	- 0.08 -0.03	< - 0.05 > 0.00
GCT Exit Temperature	°F	HRA	443	>453
Maximum Baghouse Inlet Temperature	°F	HRA	390	> 400
Minimum Carrier Flow Rate	cfm	HRA	180	<180
Minimum Lime Feed Rate	lb/hr	N/A	209	< 209
LLGF Atomization Pressure	psig	HRA	62	< 57

[a] HRA = Hourly Rolling Average; INST = Instantaneous

Table 4-2 Process Instrumentation Overview

Process Parameter and Instrument Tag # (Kiln 1 / Kiln 2)	Units	Location	Operating Range
Kiln Back-End Exit Temperature (TT-4303 / TT-2105)	°F	Exhaust Ductwork	866-1,091
Shale Feed Rate (AR-4301 / AR-2401)	tph	Feed Conveyor	0-25
CO concentration (B7-889 & B7-890 / XO7-400 & F6-187) (F-NR.N1-AD-764, 766)	ppm	Baghouse Exit Duct	Automatic: 0-100; 0-300; 0-1,000; 0-3,000
O_2 concentration (B7-066 & B7-067 / AO2-611 & F6-279) (F-NR.N1-AD-765, 767)	%	Baghouse Exit Duct	Automatic: 0-10; 0-15; 0-25
LLGF Feed Rate (MM-4301 / MM-2401)	gpm	Kiln Control Room	0-10.5
Flue Gas Flow Rate K2 (FT-5555) Flue Gas Flow Rate K1 (FT-5566)	wet scfm fps	Exhaust Stack Duct after baghouse	0 – 86,000 0.33 – 131.2
LLGF Atomization Pressure (PT-9104 / PT-2305)	psig	Kiln Control Room	25-80
Sorbent (Lime) Feed Rate (Lime_Feed / Lime_Feed)	lb/hr	Lime Feeder	0 - 500
Sorbent (Lime) Carrier Fluid Flow Rate (Lime_Flow / Lime_Flow)	scfm	Lime Feeder	100 - 300
GCT Exit Temperature (TT-4301 / TT-2403)	°F	Heat Exchanger Damper Inlet	350-550
Baghouse Inlet Temperature (TT-4302 / TT-2404)	°F	Heat Exchanger Damper Outlet	350-550
Kiln Pressure (DPT-5203 / DPT-2104)	in. w.c.	Kiln Front Hood	-2.0 to + 1.0

Table 4-3 Stack Monitoring Instrumentation –

Location	Parameter	Serial No.	Manufacturer	Operating Principle	Ranges
Kiln 1	O_2 CO	10344	Rosemount CT5100	Quantum Cascade Laser (QCL)	0 – 25% 0 – 200 & 0-3000 ppm
Kiln 1	Stack Flow	13040641 E	Optical Scientific Inc. (OSI)	optical scintillation	0-44,500 SCFM (wet)
Kiln 2	O_2 CO	10343	Rosemount CT5100	Quantum Cascade Laser (QCL)	0 – 25% 0-200 & 0-3000 ppm
Kiln 2	Stack Flow	14050689 E	Optical Scientific Inc. (OSI)	optical scintillation	0-44,500 SCFM (wet)

5.0 Test Program Operations

This section provides an overview of test program design, planned kiln operating conditions, planned waste feed requirements, overall sampling strategy and anticipated test schedule.

5.1 Test Program Rationale

This CPT program has been designed to re-establish compliance with all applicable MACT emission standards as previously described in **Table 1-2**. Two (2) LWAK operating conditions are planned for this test program. The planned operating conditions will be representative of stressed operations at the facility and will be conducted using reasonable worst case waste materials and fuels, including waste fortification for the purposes of establishing appropriate metal feed rate limits as outlined subsequently in this section.

Detailed information on the sampling and analytical methods to be followed for the program along with other information related to the field test program procedures and analytical protocols is provided in **Section 6.0** (Sampling and Analytical Program) and **Appendix A** (Quality Assurance Project Plan).

5.1.1 Demonstrate Compliance with Performance Standards

The test program will feature a comprehensive set of emission measurements to demonstrate compliance with the applicable performance standards listed previously in **Table 1-2**.

5.1.2 Sampling Strategy

The overall testing strategy has been developed to provide the data needed to demonstrate compliance with the applicable MACT emission standards. Each LWAK is equipped with a stack sampling arrangement consisting of four or more ports at each of two elevations (sampling platforms), with each port oriented at a 90-degree separation from the others. This arrangement is more than sufficient to allow for all planned sampling to be completed concurrently.

Each LWAK is also equipped with sampling ports prior to the air pollution control system (inlet sampling ports). Each inlet sampling location consists of two ports oriented at a 90-degree separation from the other.

The length of each sampling run will be determined by the need to collect sufficient sample volume to obtain adequate detection limits. Expected sample train run times are described more completely in **Section 6.0** (Sampling and Analysis Program) and **Appendix A** (QAPP) of this document.

5.1.3 Dealing with Potential Process Interruptions

If there is a waste feed interruption (i.e., AWFCO) during a sampling run, the following guidelines are suggested and will only be implemented with NYSDEC consultation and concurrence:

- Sampling will be stopped as quickly as possible after the interruption.
- If the interruption is less than 30 minutes, there will be a 15-minute line out period, and then sampling will recommence.
- If the interruption is between 30 and 60 minutes, there will be a 30-minute line out period and then sampling will recommence.
- If the interruption exceeds 60 minutes, there will be a one-hour line out period before testing is resumed.

- If the interruption lasts more than 60 minutes and there is little hope of completing the day's run, then the run will be aborted and repeated at later time.

5.2 Planned Test Conditions

For this program, two (2) test conditions will be conducted to confirm compliance with the MACT standards. The operating conditions for the test are based on a review of prior operating data, experience operating under the current set of OPLs. The operating conditions described below will be performed in the order listed.

Test Condition 1 will establish new operating limits for LLGF feed rate, waste feed atomization pressure, shale production rate, kiln back-end temperature and GCT exit temperature. **During Condition 1, testing will be performed for PCDDs/PCDFs.**

Determination of the destruction and removal efficiency (DRE) of one or more principal organic hazardous constituents (POHCs) as required by the standards listed in 40 CFR Part 63.1221(c) will be conducted during test condition 1.

Test Condition 2 will establish new operating limits for shale production rate, baghouse inlet temperature, total metals feed rates, total chlorine feed rate, dry sorbent feed rate and dry sorbent carrier fluid flow rate, GSA and baghouse lime feed rates. **During Condition 2, testing will be performed for metals, PM and HCl/Cl_2.**

An overview of planned test conditions along with target operating ranges is provided in **Table 5-1**.

Each kiln will be operated under reasonable worst-case conditions to generate higher than normal emissions to demonstrate that even under stressed conditions, the kiln's emissions are below the regulatory limits.

Pursuant to 40 CFR 63.1207(g)(1), chlorine content in the LLGF will be normal or higher during the PCDD/PCDF test runs (Test Condition 1). Based on fuel data from calendar year 2018, Norlite will ensure that the chlorine concentration (measured as total halogens) will be approximately 1.5 percent on a weight basis.

Ash content will be normal or higher during the semi-volatile metal and low volatile metals test runs (Test Condition 2). Based on fuel data from calendar year 2018, Norlite will ensure that the ash concentration will be approximately 1.7 percent on a weight basis.

The chlorine and ash content results will be reported with the fuel analysis in the test report.

The baghouse pulse cycle will be maintained at its normal rate throughout the particulate matter, semivolatile metals and low volatile metals test runs (Test Condition 2). The baghouse pulse cycle will be included with the operational data in the test report.

5.3 Description, Preparation and Delivery of CPT Feed Materials

To the extent practicable (and except for the added constituents subsequently noted), reasonable worst-case materials processed at the facility will be fed to the kiln during the test program. Pumpable waste materials will be stockpiled in appropriate feed tanks to meet the objectives for the target parameters. All waste materials will be delivered to the kiln in accordance with routine operation and currently permitted procedures as described elsewhere in this document.

Table 5-1 Target Operating Parameters for the 2020 CPT [a]

Process Parameter	Units	Condition 1	Condition 2
Maximum LLGF Feed Rate	gpm	10.5	
Minimum LLGF Feed Atomization	psig	56.4	
Maximum Shale Feed Rate	tph	24.7	24.7
Maximum Total Chlorine Feed Rate	lb/hr		96.8
Maximum Total Mercury Feed Rate	lb/hr		0.010
Maximum Total LVM Feed Rate	lb/hr		11.0
Maximum Total Pumpable LVM Feed Rate	lb/hr		3.72
Maximum Total SVM Feed Rate	lb/hr		11.1
Minimum Kiln Back-End Temperature	°F	866	
Maximum GCT Exit Temperature	°F	453	
Minimum Total Baghouse / GSA Lime Feed Rate	lb/hr		209
Minimum Total Baghouse / GSA Carrier Fluid Flow Rate	cfm		180
Maximum Baghouse Inlet Temperature	°F		400

a - Values listed are targets and may vary by ± 20% during actual testing. Note that values are only listed for the condition during which they will be re-established.

5.4 Test Materials and Quantities

5.4.1 Quantity of Hazardous Waste to be Burned

The quantity of hazardous waste (LLGF) to be burned during this program is based on the target feed rate specified in **Table 5-1**. Assuming about 15 hours of waste burning over each day, and the planned schedule outlined later in this section, it is estimated that about 26,000 gallons of LLGF will be burned during the test program.

5.4.2 Time to Achieve Steady-State Operation

The time required to reach steady-state operation is governed primarily by the time to establish acceptable rolling averages for the applicable process parameters. HRAs for all applicable parameters will be established at or near their desired values prior to test initiation. One-hour of steady state operation will be required to establish desired HRAs prior to test initiation. If emission sampling must be interrupted during the middle of a run, the one-minute averages during the interruptions will not be used for the calculations of HRAs following the interruption. The last HRA considered will be concurrent with the end of the test run sampling period.

5.5 Waste Feed Fortification

In order to establish appropriate metals feed rate limits, and to demonstrate the required performance criteria for DRE it will be necessary to fortify (augment) the hazardous waste fuel (LLGF) with various constituents.

5.5.1 Metals Constituent Additions

To demonstrate the required performance criteria for metals control, it will be necessary to fortify (augment) the LWAK fuel (LLGF) with inorganic constituents. This section describes the selected constituents and relevant parameters pertaining to waste feed fortification.

5.5.1.1 Waste Feed Strategy

Norlite intends to fortify the LLGF with several metal constituents for the purposes of establishing desired metal feed rates and demonstrating satisfactory metals removal from the system. Norlite plans to add solutions of metal acetates to the LLGF feed tanks (if necessary) to achieve the desired feed concentrations.

Norlite plans to use cadmium acetate, chromic acetate and mercuric acetate to fortify the LLGF used in the test. These organometallic compounds were chosen due to their solubility in alcohol which is a major component of the LLGF.

5.5.1.2 Metal Feed Rate

The goal for the CPT will be to establish feed rate limits for metals consistent with current permit levels. The ultimate objective will be to use the SREs demonstrated during the CPT for mercury, chromium (representing the LVM group) and cadmium (representing the SVM group) to arrive at feed rate limits that meet the appropriate emission standard.

Justification for the selection of surrogate metals comes from the MACT rule itself and has been supported in EPA Regions 4 and 5. In the MACT preamble (pg 52946), EPA provides discussion on the issue of metal surrogates and states in the 3rd column, 2nd paragraph that “For example, you may use chromium as a surrogate during the performance test for all low volatile metals. Similarly, you may use lead as a surrogate for cadmium, the other semi-volatile metal. This is because the metals within a volatility group have generally the same volatility.” (EPA also goes on to say that you could also use one SVM as a surrogate for any LVM because SVM will be more difficult to control.)

As stated above, it is expected that any metals added to the LLGF feed tank will be in the form of metal acetates. An example feed rate calculation is presented in **Table 5-2**. This feed rate represents the limit for arsenic, beryllium and chromium combined. These calculations assume that the minimum SRE required to comply with the MACT LVM standard of 110 $\mu g/m^3$ is 99.85%. Following the CPT Norlite will set significantly lower actual feed rates in the NOC based on actual SRE.

Table 5-2 Metals Feed Rate – Example Calculations

Parameter	LVM	SVM
Surrogate Metal	Chromium	Cadmium
MACT standard, µg/m³ @ 7% O2	110	250
Assumed SRE (%)	99.85%	99.85%
Assumed Stack Flow rate (dscfm)	33,800	33,800
Assumed Stack Oxygen (%)	15.0	15.0
Maximum Emission Rate (lbs/hr)	0.0060	0.0136
Maximum CPT Feed Rate (lb/hr)	4.0	9.0

5.5.2 POHC DRE

Principal organic hazardous constituent (POHC) DRE will be demonstrated during Condition 1. Since there is not a POHC present in the native waste at a sufficient concentration to enable detection following high levels of destruction in the kiln, fortification of the waste stream is necessary. Monochlorobenzene (MCB) will be used to fortify the LLGF feed stream. B3 Systems of Raleigh, NC has been retained to supply the MCB material and to spike the material into the kiln. The target MCB injection rate was 75 lb/hr for each of the three test runs.

5.6 Test Schedule

This section summarizes the anticipated schedule for test program implementation. **Table 5-3** provides an anticipated schedule associated with the day-to-day activities of the CPT field program. This schedule includes days for arrival, safety orientation and testing and assumes that testing will be conducted over the course of three days per unit.

Given that testing is planned for several long days, during the test setup day, Norlite, NYSDEC and the CK field team leader will develop a consensus regarding the latest time that a run will be started for the planned test day.

Table 5-3 Anticipated CPT Field Schedule (per unit)

	Day
Arrival onsite, site safety training and equipment set-up. Also conduct preliminary stack measurements.	1
Test Condition 1, Runs C1-R1 and C1-R2	2
Test Condition 1, Run C1-R3	3
Test Condition 2, Runs C2-R1, C2-R2 and C2-R3	4
Ship samples. Pack equipment and depart site.	5

6.0 Sampling and Analysis Program Overview

This section presents a summary of the sampling and analysis program for this project. Further details on the overall sampling and analysis program are found in the QAPP for this project, located in Appendix A. As noted in previous sections of this document, the test program will consist of two test conditions consisting of three (3) sampling runs each per kiln.

6.1 Liquid Waste Sampling and Analysis

The LWAKs burn a single liquid hazardous waste feed stream that will be sampled prior to being fed to the kiln in accordance with acceptable protocols. A sampling tap in the feed line is available for this purpose. The LLGF will be sampled every 15 minutes during each run, composited and analyzed for the parameters listed in **Table 6-1**.

Facility personnel will collect these samples under CK's direction using pre-cleaned sample bottles suitable for the type of sample being collected and the intended analysis. CK will provide all sample containers for stack samples and assume custody of the samples at the end of each day. Norlite will provide sample containers supplied by AES for all feed stream analysis samples. Prior to initiating field-testing activities, CK and Norlite will hold a training session with facility staff responsible for sample collection to review grab sampling techniques, size of sample aliquots, compositing procedures, and sample bottles to be used. Agency personnel who will be providing testing oversight are invited to attend this training session. Any agency required split samples should be announced at this time and containers provided by Agency personnel.

6.2 Used Oil Sampling and Analysis

It is not anticipated that used oil will be fed to the kiln during the test. However, should this not be the case, used oil will be sampled at the same frequency and analyzed for the same parameters as the LLGF.

6.3 Shale Sampling and Analysis

Raw shale fed to the kiln will be sampled at the beginning, middle and end of each run from the conveyor belt using a scoop with an appropriate aliquot being emptied into the final collection bottle. Shale will be analyzed using the methods and procedures identified in **Table 6-1**.

Table 6-1 Sampling and Analytical Summary for LLGF and Shale

Analytical Parameter	LLGF	Shale
Total Chlorine	EPA M 5050 (Prep) EPA M 9253 (Silver Nitrate Titration)	EPA M 5050 (Prep) EPA M 9056A (IC)
Mercury	EPA M 7471B	EPA M 7471B
Other Metals	EPA M 3051A(Prep) EPA M 6010C	EPA M 3051A (Prep) EPA M 6010C
Sediment	ASTM D 1796 (Norlite SOP # 04-049)	Not Applicable
Ash Content	ASTM D 482-13	Not Applicable
Density	Gravimetric (Norlite SOP # 04-012)	Not Applicable
Heat Content	ASTM D 240-17	Not Applicable

6.4 Stack Gas Sampling and Analysis

The exhaust stack will be sampled for the parameters summarized below in **Table 6-2**. These include flue gas velocity, flow rate, temperature, moisture content and fixed gas (O_2 and CO_2) composition; PCDDs/PCDFs; metals; HCl / Cl_2; particulate matter; and carbon monoxide (CO).

Table 6-2 Sampling and Analytical Summary for Exhaust Gas Stream per Condition per Unit

Stream Sampled / Sampling Frequency	Test Parameter	Sampling Method	Analytical Method(s)
Stack Flue Gas			
3-hr run / 3 runs total	PCDDs/PCDFs	EPA Method 0023A	EPA Method 0023A
3-hr run / 6 runs total	O_2 and CO_2	EPA Method 3A	EPA Method 3A
3-hr run / 3 runs total	DRE	EPA Method 0025A/18	EPA Method 0025A/18
3-hr run / 3 runs total	THC	RM 0030	RM 0030
2-hr run / 3 runs total	Mercury	EPA Method 29	EPA Method 29
2-hr run / 3 runs total	LVM and SVM	EPA Method 29	EPA Method 29
2-hr run / 3 runs total	Particulate Matter	EPA Method 5	EPA Method 5
2-hr run / 3 runs total	HCl and Cl_2	EPA Method 26A	EPA Method 26A
Facility CEM / 6 runs total	CO, O_2 & gas flow rate	Facility CEM QA Plan	Facility CEM QA Plan

Stack gas emission samples will be collected from test ports that meet the minimum criteria specified in EPA Method 1. On each stack, test ports are located on two levels, with four sampling ports each, are available to accommodate testing of all emissions test parameters. Further details on the stack configuration, field data sheets, isokinetic sampling train setup and recovery and program QA/QC are provided in the QAPP for this project (**Appendix A**).

Each LWAK is also equipped with sampling ports prior to the air pollution control system (inlet sampling ports). Each inlet sampling location consists of two ports oriented at a 90-degree separation from the other. Sampling at this inlet location will be performed in support of the HCl Alternative Monitoring Plan proposal.

Gas stream flow rate and moisture will be determined during each test run in conjunction with each isokinetic sampling train. Gas stream velocity will be determined using a pitot tube and water manometer in accordance with EPA Method 2. Gas stream temperature will also be determined at each of the Method 2 traverse points using a Type K thermocouple and pyrometer. Gas stream moisture will be determined as specified in EPA Method 4 concurrent with each isokinetic sampling method. In this procedure the impinger contents are measured for volume or weighed before and after each test run and used in conjunction with the metered gas volume to determine the gas stream moisture content.

7.0 Final Data Reporting

The final report for this project will be a comprehensive data compilation that properly and logically documents and certifies all required test results. The report will include all the required elements of a MACT NOC as outlined in **Table 7-1** below.

Table 7-1 Types of Information to be presented in Norlite's NOC

Facility Information	
Facility Name and Location: Norlite LLC, Cohoes, NY 12047	
Contact: Prince Knight –(518)- 235-0401, Ext 4049 – prince.knight@tradebe.com	
Source Information	
Title V Classification: Major Source	
Affected Sources: Lightweight Aggregate Kilns 1 and 2	
Air Pollution Control: Cyclone, GCT, GSA and fabric filter	
Applicability	
The kilns are regulated under 40 CFR Part 63 Subpart EEE (HWC MACT) as lightweight aggregate kilns	
Emission Standards	
The applicable emission standards (listed in **Table 1-1** of this CPT Plan) for the Norlite facility are based on the limits outlined at 40 CFR 63.1221 for lightweight aggregate kilns. All emission standards (except DRE) are corrected to 7% oxygen.	
Compliance Demonstrations	
Once the CPT has been completed, Norlite will summarize the test results and show that all emission standards were met and that all operating limits were satisfied.	
Certification	
Norlite LLC hereby certifies that: All required CEMS and CMS are installed, calibrated and continuously operating in compliance with the requirements of Subpart EEE; Based on the results of the CPT conducted in [DATE], the LWAKs are operating in compliance with the emission standards and operating requirements of 40 CFR Part 63 Subpart EEE, and the OPLs required by 40 CFR 63.1209 established during this CPT ensure continued compliance with the standards.	
Signature:	
Name:	
Title:	**Date:**

CK plans to follow the generic guidance provided by EPA for CPT report preparation. The report will be structured in a similar manner with sections delineated as follows:

- Summary of Test Results and Comparison to MACT Standards
- Report Certification
- Introduction and Overview of Process Description
- Process Operating Conditions During the CPT
- Kiln Feed Stream and Stack Sampling Test Results
- Quality Assurance / Quality Control Documentation

Report appendices will also provide detailed supporting documentation and would include:

- Process Operating Data
- Field Data Sheets and Sampling Documentation
- Analytical Data Reports
- CMS / CEMS performance Evaluation Test Evaluation Results

This report will be submitted concurrent with NOC. Further details on data reporting are provided in Section 13.0 of the QAPP (Appendix A).

8.0 Health and Safety

8.1 Plant Access and Sampling Location Access

Visitors at Norlite are required to sign at the entry gate and will go through a site-specific orientation. Non office visitors are expected to have basic personal protective equipment (PPE) eye protection, safety footwear, head protection, hand protection, and hearing protection for site walks. Visitors will be escorted during their visit to designated work areas and visitors are not allowed to wander to undesignated areas. Visitors that require facility walk downs will be escorted during the entire duration of the visit.

8.2 Sampling Location Safety

8.2.1 Field Safety Responsibilities

A Safe Work Plan (SWP) will be developed by CK Project Manager before the start of the test program identifying potential hazards, emergency procedures, roles, and responsibilities, required training and task hazard assessment.

The CK PM is, by designation, the individual who has the primary responsibility for ensuring the health and safety of CK employees during this test program. CK Project Team Leader on site is responsible for the implementation of safety procedures in the field. Field Team Leader will ensure that field staff has necessary PPE not limiting to eye protection, safety footwear, head protection, hearing protection, hand protection and fall protection equipment.

Access to the primary sampling location is via stairs and the sampling platform is a Mine Safety and Health Administration (MSHA) approved platform. Access to a secondary sampling level is made via a caged ladder. If this sampling platform is used, CK sampling equipment will be hoisted with a rope and pulley setup. Necessary precautions will be taken by barricading the drop area under the sampling platform with caution tape.

Safety concerns that may arise before or during the sampling process will be accessed and mitigated using hierarchy of controls before the work is resumed.

Appendix A

Quality Assurance Project Plan (QAPP)

Quality Assurance Project Plan (QAPP)

MACT CPT Program

Norlite LWAK No. 1 & 2

This document presents the Quality Assurance and Quality Control goals, objectives, and procedures for the Norlite comprehensive performance test (CPT) program to be conducted beginning the week of September 21, 2020. The quality assurance/quality control procedures and criteria for this program will comply with the requirements of this document and any updates. The analytical work conducted will incorporate the QA/QC requirements of the approved methods. This document has been prepared using available guidance provided in the following documents:

- "Component 2 - How to Review a Quality Assurance Project Plan (including Attachment A - Generic Trial Burn QAPP", Hazardous Waste Combustion Unit Permitting Manual, U.S. EPA Region 6, January 1998.
- "Handbook – Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration" (EPA/625/6-89/023 January 1990).

Facility ID Number: NYD 080 469 935

Prepared for: Norlite LLC, Cohoes, NY

Prepared by: CK Environmental Inc., Canton, MA 02021

Revision No.: 1

Date of Rev 1 Submittal: July 10, 2020

Expected Test Start Date: September 22, 2020

:

Project Approvals

David Maguffin, Plant Manager
Norlite

Date

2/13/20202

Kevin J. Kelley, QSTI Project Manager
CK Environmental

Date

Tara Daniels, Laboratory Coordinator
Adirondack Environmental Services

Date

Douglas Czachor, Laboratory Coordinator
Norlite

Date

2020/02/12

Salima Haniff, Quality Assurance Manager
Bureau Veritas Laboratories

Date

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1.0 Project Description

This project will consist of a comprehensive sampling and analysis program designed to re-certify compliance with all applicable MACT (Subpart EEE) performance standards on Kiln 1 and 2 following installation and start-up of new APC systems. Testing will be performed under two (2) operating conditions, per kiln, comprised of three (3) sampling runs per condition. The reader is referred to other sections of the overall CPT Plan for further details on program scope, test objectives and target parameters for emission measurements and process monitoring. The remainder of this QAPP outlines the detailed measures that will be followed to ensure collection of valid data.

2.0 Project Organization

CK Environmental (CK) will be responsible for overall management of this MACT CPT program. The CK Project Manager, Mr. Kevin Kelley, will provide overall direction of the program and will report to the Norlite Project Manager, Mr. Prince Knight. As project manager, Mr. Kelley will be responsible for project design and implementation, communicating with the client and scheduling all activities.

2.1 Facility Owner / Operator: Norlite, LLC

Mr. Prince Knight is the Environmental & Regulatory Compliance Manager at Norlite and is the Norlite project manager for the CPT program. Mr. Knight will be responsible for coordinating Norlite's efforts during the program and will be the principal point of contact during implementation of the field test program. Mr. Knight will be assisted by Operations in waste feed stream sampling and process data retrieval.

2.2 QA Officer

Mr. Kevin Kelley will also serve as the project Quality Assurance Officer (QAO) and will be responsible for review and approval of this QAPP, as well as any subsequent revisions. He will monitor implementation of field and laboratory activities and schedule performance and/or system audits as discussed later in Section 9.0. The QAO will report on any conditions noted which may adversely affect data quality.

Mr. Mike Kelley will provide oversight of the CK field measurement team functions including field sampling, data verification and data quality assessment activities and will prepare a section of the Final Report summarizing QA/QC activities and providing an overall evaluation of data quality.

2.3 Regulatory Oversight

The New York State Department of Environmental Conservation (NYSDEC) and EPA Region 2 will be the primary Agencies involved in review and approval of this QAPP.

CK will obtain commercially available audit samples for Method 26A and Method 29 from accredited audit sample provider Environmental Resource Associates located in Golden, CO for the measurement program. The test consists of blind audit samples provided by the accredited audit sample provider are evaluated during the performance test program and analyzed by the same laboratory following the same procedures as the compliance samples. Per the audit program, the results of these audits will be supplied to the NYSDEC.

2.4 Laboratory Services Coordinators

Bureau Veritas Laboratories (BV) will perform all emission sample analyses. Marinela Sim will serve as the laboratory services coordinator (LSC), who will be the principal point of contact for the CK Management Team. The LSC will review QA requirements with all laboratory staff to ensure that all required measures are taken to meet data quality objectives. They will monitor the shipment and receipt of samples, track analytical progress and review data as reported from the laboratories for completeness. Ms. Tara Daniels will serve as the LSC for Adirondack Environmental Services (AES). AES will perform kiln feed and fuel analyses for this program. Mr. Douglas Czachor will serve as the LSC for Norlite's in house laboratory and will coordinate sample deliveries to AES and be the main liaison between AES and Norlite. Each LSC will be responsible for validation of all data generated by the laboratory for this program and will provide all necessary documentation for inclusion in the final report.

3.0 Data Quality Objectives

This section provides a general overview of the data quality objectives (DQOs) for this test program. Specific DQOs for each individual sampling train and/or each analytical methodology performed by the subcontractor laboratories are provided later in Section 7.0 of this QAPP.

3.1 Precision, Accuracy and Completeness

The collection of data to fully characterize the LWAK waste feed material and stack gas emissions requires that sampling and analysis procedures be conducted with properly operated and calibrated equipment by trained personnel. The overall program has been designed with consideration of sampling parameters and analytical limits to ensure that the achieved method-specific detection limits for measured emissions will be more than adequate for demonstrating compliance with the MACT emission standards and performance criteria. **Table 3-1** provides a summary of the overall precision, accuracy and completeness objectives for the program.

Precision is defined as a measurement of mutual agreement among individual measurements made under prescribed similar conditions. Precision is expressed in terms of relative percent difference (RPD) between duplicate determinations and in terms of relative standard deviation (RSD) when 3 or more determinations are made. Overall precision for analysis of the waste feed streams will be assessed through the analysis of one set of duplicate samples for each designated parameter.

Accuracy is the degree of agreement of a measurement with an accepted reference or true value. Analytical accuracy will be measured through the recoveries of surrogate spikes, matrix spikes, analysis of standard reference materials or audit sample analysis. Surrogates are compounds added to samples submitted for organic analyses prior to extraction and analysis; their recoveries are measured to assess sample-specific analytical efficiency and accuracy. Matrix spike (MS) samples for the waste feed will be prepared by spiking known amounts of target analytes into a portion of the sample. Matrix spike samples for the stack organic analyses will be prepared by spiking known amounts of target analytes into the sampling media and then carrying the spiked sample through the entire preparation and analysis sequence. Recoveries are monitored to assess laboratory and method accuracy. LCS will also be used to distinguish between method performance and matrix effects on accuracy. LCS and MS solutions will be independent from calibration standards.

Completeness is a measure of the amount of valid data obtained compared to the amount that was expected under normal conditions. The overall program objective is to obtain valid data for three (3) runs for each test condition. For all data considered critical to the investigation, a completeness objective of 100% has been established. As a result, critical priority data from each set of three (3) runs should achieve the precision and accuracy goals established herein. This completeness criterion applies to all permit parameters in emissions samples as well as any feed/process stream samples. Individual samples for which the critical data points do not achieve accuracy and/or precision data quality objectives may require reanalysis. Results for samples where matrix interferences preclude meeting objectives for the recoveries of surrogates or spikes will be evaluated for potential bias to calculated emission results. In summary, the completeness goals are stated at 100% since a minimum of three valid runs is necessary to assess operation at each test condition.

Table 3-1 Precision, Accuracy and Completeness Objectives

Stream Sampled / Sampling Method	Parameter	Sampling Precision (RPD)	Analytical Precision (RPD)	Analytical Accuracy (%)	Completeness (%)
Kiln Feed Materials					
Grab / Composite	Ash Content	< 50	< 35	75 -125	85
Grab / Composite	Density	< 50	< 35	75 -125	85
Grab / Composite	Heat Content	< 50	< 35	75 -125	85
Grab / Composite	Total Chlorides	< 50	< 10	75 -125	85
Grab / Composite	Metals **(a)**	< 50	< 35	75 -125	85
Stack Flue Gas					
EPA Method 0023A	PCDDs/PCDFs	**(b)**	see Table 7-6	see Table 7-6	100
EPA Methods 5	PM	**(b)**	±0.5 mg	±0.1 mg	100
EPA Methods 26A	HCl/Cl_2	**(b)**	see Table 7-6	see Table 7-6	100
EPA Method 29	Metals (a)	**(b)**	see Table 7-4	see Table 7-4	100
Facility CEMS	CO and O_2	**(b)**	± 3% span	± 3% span	100
EPA Method 3/3A	CO_2 and O_2	**(b)**	0.5%	0.5%	100
Method 0030	VOC	**(b)**	0.1 ug/M3	0.1 ug/M3	100
EPA Method 25A/18	VOC	**(b)**	± 2% span	± 2% span	100

(a) Target metals in the LLGF include arsenic, beryllium, cadmium, chromium, lead and mercury (MACT).
(b) Precision not determinable for stack gas sampling since co-located sampling trains will not be used.
Note: This table represents an overall summary of the QA objectives for this project. Please refer to the method-specific QA summary tables in Section 7.0 of this QAPP.

3.2 Representativeness and Comparability

It is recognized that the usefulness of the data is also contingent upon meeting the criteria for representativeness and comparability. Wherever possible, reference methods and standard sampling procedures will be used. The QA objective is that all measurements be representative of the matrix and operation being evaluated. The detailed requirements for sampling given in the various EPA Reference Methods will be followed to ensure representative sampling of flue gases. The grab/composite sampling regimen for the kiln feed stream during each test run will also provide representative samples of this matrix.

The corresponding QA objective is that all data resulting from sampling and analysis be comparable with other representative measurements made by the field sampling team, on this or a similar process operating under similar conditions. The use of published sampling and analytical methods and standard reporting units will aid in ensuring the comparability of the data.

3.3 Data Usability and Detection Limit Considerations

CK and each of the subcontract laboratories on this program are aware of the requirement that all data generated for a program of this nature are of high quality and that detection limits reported are usable for compliance assessment purposes. We have reviewed the relevant EPA Region 2 guidance on this issue and believe that the data to be generated for this program will meet or exceed EPA's goals based on our past experience with each specific laboratory on past similar programs. All the laboratories to be used on this program follow 40 CFR Part 136, Appendix A for the determination of method-specific method detection limits (MDLs) for the various analytes to be measured in this program. However, for the purposes of data reporting for this program, method specific reporting limits (RLs) will be used wherever a sample is determined to be below detection. Two categories of such RLs is envisioned for this project:

- **Waste Feed Samples** – RLs for metals and total chlorides in the LLGF samples will be specific to the actual waste matrix. In the absence of actual detected values, the full value of the RL will be used in performing any required calculations pertaining to compliance with feed rate limits. The RLs to be reported for these parameters are equivalent to sample quantitation limits (SQLs) as defined by EPA, since they consider any required sample dilutions.
- **Isotope Dilution Methods** – For this program, the only isotope dilution method is EPA Method 0023 (PCDDs/PCDFs). Reporting limits for this method incorporates specific criteria for development of estimated detection limits (EDLs) and estimated maximum possible concentrations (EMPCs). Emission calculations that rely on either the EDL or the EMPC are not expected to present any problems on this project. It is noted that for establishing compliance with the MACT PCDD/PCDF emission standard, detection limits can be treated as zero.
- **Non-Isotope Dilution Methods** – For this program, such methods include EPA Method 26A (HCl / Cl_2). Reporting limits anticipated for these methods are not expected to present any problems on this project. The full value of any RL will be used in making any emission determinations if the analyte is reported below detection.

4.0 Sampling and Monitoring Procedures

This section describes the procedures that will be followed during the field sampling program. Throughout the overall program, all sampling will be performed using sampling protocols described herein and approved by the regulatory agencies. Agency approval will be obtained for any deviations from or changes to the approved QAPP which may be warranted prior to program implementation because of changes in personnel or facility circumstances. If situations occur during any preliminary testing that may be done prior to the CPT which necessitates deviations from the plan, the agency will be notified, and onsite approval requested. Any such deviations from the specified protocols will be fully documented in the final report for the project.

A discussion of the compliance strategy, test conditions and sampling and analysis program was provided previously in Sections 1.0, 5.0 and 6.0 of the CPT Plan. In general, however, the test program is configured to collect samples during six (6) runs conducted under two (2) process operating conditions per unit.

Sample team meetings will be held to designate responsibilities to each team member. Assignments will be based on individual experience and relative importance of the assigned task. Other activities performed in the office prior to the field test program include generation of sample checklists, printing of computer-generated sample labels, and proper packing of all equipment. Equipment will then be transported by truck to the sampling location. Site setup will involve moving the equipment to the vicinity of the sample collection area. A separate office trailer or other suitable onsite facility will be used to serve as a sample train setup and recovery area and sample custody area.

4.1 Kiln Feed Materials Sample Collection

4.1.1 Sampling Locations

The liquid waste feed material and shale feed will be sampled prior to being fed to the kiln in accordance with acceptable protocols. Taps in the feed line will be used to access the LLGF; shale will be sampled directly from the feed conveyor.

4.1.2 Sampling Procedures

Facility personnel will perform all feed stream sampling. Each sample will be assigned a unique sample code for identification. Enough will be collected to allow for sample splits, backup or archived samples and duplicates, as applicable. (NYSDEC staff observing the test will provide their own sample bottles for sample splits.) Facility personnel will collect these samples under CK's direction using pre-cleaned sample bottles suitable for the type of sample being collected and the intended analysis. Adirondack will provide all sample containers and CK will assume custody of the samples at the end of each day. The feed materials will be characterized for the parameters outlined in **Table 4-1**.

Grab samples of LLGF will be collected at 15-minute intervals during each run and will result in a single composite sample at the end of each run. Samples will be collected in appropriate sample bottles, depending on the analysis to be performed. Grab samples will be collected from sample taps. The sample tap is opened and the line is flushed with the material being collected. The flush is then discarded into a container and managed appropriately, and then the specified sub-sample is collected. This ensures that the actual material collected is representative of the stream. At the prescribed frequency, liquid is collected into a large beaker or sample jar.

Raw shale feed will be sampled at the beginning, middle and end of each test run. The shale will be sampled at the conveyor belt using a scoop with an appropriate aliquot being emptied into the final collection bottle.

Table 4-1 Sampling and Analysis Summary for Kiln Feed Materials

Analytical Parameter	LLGF	Shale
Total Chlorine	EPA M 5050 (Prep) EPA M 9253 (Silver Nitrate Titration)	EPA M 5050 (Prep) EPA M 9056A (IC)
Mercury	EPA M 7471B	EPA M 7471B
Other Metals	EPA M 3051A (Prep) EPA M 6010C	EPA M 3051A (Prep) EPA M 6010C
Sediments	ASTM D 1796-97 (Norlite SOP # 04-049)	Not Applicable
Ash Content	ASTM D 482-13	Not Applicable
Density	Gravimetric (Norlite SOP # 04-012)	Not Applicable
Heat Content	ASTM D 240-17	Not Applicable

4.2 Stack Emission Measurements

Gases discharged from the exhaust stack will be sampled for the following parameters:

- Flue gas velocity and flow rate, temperature, moisture content and composition of fixed gases (O_2 and CO_2);
- PCDDs/PCDFs;
- Particulate Matter
- HCl/Cl_2
- Metals;
- THC (for DRE) – 25A/18
- POHC (for DRE) - 0030, and
- CO corrected to 7% O_2

Table 4-2 provides a summary of the stack sampling protocols and procedures for the program. The following sections provide additional information on the sampling location and summaries of the sampling methodologies. In addition, example field data sheets to be used during the program are provided in **Attachment A**. Summaries of relevant information pertaining to setup and recovery of the isokinetic sampling train are provided in **Attachment B**.

Table 4-2 Overview of Stack Emission Measurement Program

Stream Sampled / Sampling Frequency	Test Parameter	Sampling Method	Analytical Method(s)
Stack Flue Gas			
3-hr run / 3 runs total	PCDDs/PCDFs	EPA Method 0023A	EPA Method 0023A
3-hr run / 3 runs total	DRE	EPA Method 0025A/18	EPA Method 0025A/18
3-hr run / 3 runs total	THC	RM 0030	RM 0030
2-hr run / 3 runs total	PM and HCl/Cl_2	EPA Methods 5 and	EPA Methods 5 and 26A
2-hr run / 3 runs total	Mercury	EPA Method 29	EPA Method 29
2-hr run / 3 runs total	Other Metals	EPA Method 29	EPA Method 29
3-hr run / 6 runs total	O_2 and CO_2 & gas flow rate	EPA Method 3A	EPA Method 3A
Facility CEMS / 6 runs total	CO	Facility CEMS QA Plan	Facility CEMS QA Plan

4.2.1 Sampling Locations

Exhaust gas samples will be collected in the outlet stack, which is 125 ft. above grade, has an inside diameter of 48 inches and is equipped with two sampling platforms. The samples will be collected from test ports that meet the minimum criteria specified in EPA Method 1. Level 1 ports are approximately 85 ft. above ground and Level 2 ports are about 105 ft. above ground. The Level 1 test ports will be used to accommodate simultaneous testing of all emissions test parameters.

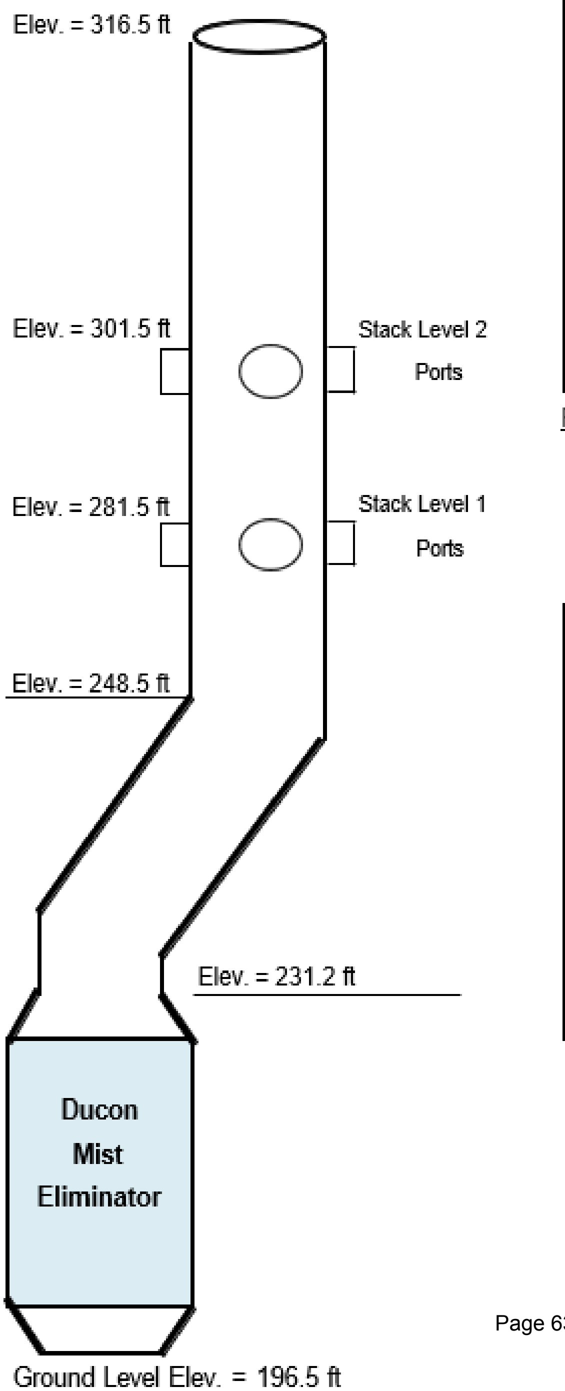
Figure 4-1 provides a schematic of the stack showing the location of the sampling ports and the upstream/downstream distances from flow disturbances. This schematic drawing also provides a schematic of the traverse point locations applicable to the isokinetic sampling trains as well as key stack parameters needed to select the appropriate size sampling nozzle.

Each LWAK is also equipped with sampling ports prior to the air pollution control system (inlet sampling ports). Each inlet sampling location consists of two ports oriented at a 90-degree separation from the other. Sampling at this inlet location will be performed in support of the HCl Alternative Monitoring Plan proposal.

4.2.2 Gas Stream Velocity and Moisture

Gas stream flowrate, moisture and fixed gas concentration will be determined concurrent with the PM/HCl/Cl_2 D/F and metals isokinetic sampling trains. Gas stream velocity will be determined using a Pitot tube and oil-gauge water manometer in accordance with EPA Method 2. Gas stream temperature will also be determined at each of the Method 2 traverse points using a Type "K" thermocouple and pyrometer. Gas stream moisture will be determined as specified in EPA Method 4 concurrent with the isokinetic sampling method. In this procedure the impinger contents are measured for volume or weighed before and after each test run and used in conjunction with the metered gas volume to determine the gas stream moisture content. Measurement of O_2 and CO_2 is for gas stream molecular weight determination and constituent oxygen correction.

Figure 4-1 Stack Sampling Traverse Point Locations



KEY STACK PARAMETERS		
Parameter	**Units**	**Value**
Temp.	°F	130
Moisture	% v/v	13.0
O_2	% v/v	14.9
CO_2	% v/v	4.6
Flowrate	dscfm	30,250
Vel. Press.	in. w.c.	0.70
Static P.	in. w.c.	1.00

From Disturbances:

Level 1: 8.25 diam. downstream & 8.75 diam. upstream

Level 2: 13.25 diam. downstream & 3.75 diam. upstream

TRAVERSE POINT DATA		
Pt. No.	**% of Diam.**	**Dist. Incl. Port (in.)**
1	4.4%	8.1
2	14.6%	13.0
3	29.6%	20.2
4	70.4%	39.8
5	85.4%	47.0
6	95.6%	51.9

Stack ID = **48** inches
Port + Wall = **6.0** inches

Kiln # 1 or # 2
Norlite LLC - Cohoes, NY

4.2.3 PCDDs / PCDFs

A Method 0023A sampling train will be used to sample for designated parameters. Specific sampling details for the Method 0023A sampling train are as follows:

- Target sampling rate - 0.75 cfm
- Sample run time - 3-hr
- Minimum sample volume required [as per 40 CFR 63.1208(b)(1)(ii)] - 2.5 dscm (88.3 dscf)
- Sample train rinse solvents: acetone, methylene chloride and toluene
- No. of sampling points per stack traverse - 6
- Total No. of sampling points - 12
- Number of field reagent blank sets collected – 1

The sampling train consists of 5 glass impingers connected in series with leak-free ground glass and Teflon o-ring connections. The first impinger is left empty and the second and third impingers are filled with 100-mL of HPLC water; the fourth impinger is empty and the fifth impinger is loaded with ~ 400 g of silica gel. The sampling train uses an untared glass fiber filter, an XAD resin trap and condensing module and is operated as specified in the method. Details pertaining to the setup and recovery of the sampling train are presented in **Attachment B** to this QAPP.

4.2.4 Metals

EPA Method 29 will be utilized for the collection of MACT and other metals including:

- MACT LVM metals – arsenic, beryllium, and chromium.
- MACT SVM metals – cadmium and lead; and
- Mercury.

Specific sampling details for the Method 29 sampling train are as follows:

- Target sampling rate - 0.75 cfm
- Sample run time - 2-hr
- Estimated sample volume – 2.4 dscm (85.0 dscf)
- No. of sampling points per stack traverse – 6
- Total number of sampling points – 12
- Number of field reagent blank sets collected – 1

4.2.5 PM and HCl / Cl_2

Sampling for PM, HCl, and Cl_2 will be performed in accordance with EPA Methods 5 and 26A. Specific sampling details for the Method 26A sampling train are as follows:

- Target sampling rate - 0.75 cfm
- Sample run time - 2-hr
- Estimated sample volume – 2.4 dscm (85.0 dscf)
- No. of sampling points per stack traverse – 6
- Total number of sampling points – 12
- Number of field reagent blank sets collected – 1

4.2.6 Continuous Emission Monitoring - CK

Measurement of O_2 and CO_2 for gas stream molecular weight determination and constituent oxygen correction will be determined in accordance with EPA Method 3A (continuous instrument analyzer method) during all test runs. These data will be obtained from the certified facility CEMS.

4.2.7 Continuous Emission Monitoring – Norlite

Plant-owned CEMS will be used during all test runs to monitor the concentrations of O_2 and CO in the stack gas and to measure flue gas flow rate. Specifications for Norlite's CEMS were provided earlier in Section 4.5 and **Table 4-3** of the CPT Plan. Stack gas is continuously drawn through a filter and heated sample transport line. The gas is conditioned to remove water, and any condensate is removed. The resulting dry gas flows into each of the gas analyzers. The O_2 results are used to correct the CO reading to 7% O_2 using the following equation:

$$CO_{Corr} = CO_{meas} \times (13.9 / (20.9 - Y))$$

CO_{corr} = CO concentration corrected to 7% oxygen

CO_{meas} = CO concertation as measured directly in stack gas stream

Y = the oxygen content measured in the stack gas stream

From the O_2 corrected readings, a one-minute average CO concentration is calculated every minute. At each successive minute, the 60 most recent one-minute average CO concentrations are used to calculate an hourly rolling average (HRA) CO concentration. The one-minute and HRA CO (O_2 corrected) and O_2 concentrations are automatically recorded by the process control / data acquisition system. If the HRA CO concentration exceeds 100 ppmv corrected to 7% O_2, then an automatic waste feed cutoff (AWFCO) is initiated. As per the requirements of 63.1209(a)(3), one-minute average CO values that exceed the upper span limit for the analyzer (3,000 ppm) will be recorded as 10,000 ppm and used in the calculation of the HRA.

The system will be certified prior to conducting the CPT following the performance specification (PS) test procedures provided in PS 2 ("Specifications and Test Procedures for SO_2 and NO_x Continuous Emission Monitoring Systems in Stationary Sources"), PS 3 ("Specifications and Test Procedures for O_2 and CO_2 Continuous Emission Monitoring Systems in Stationary Sources") and 4B ("Specifications and Test Procedures for Carbon Monoxide and Oxygen Continuous Monitoring Systems in Stationary Sources") found in 40 CFR Part 60, Appendix B. In addition, the certification will follow the general guidelines outlined in the Appendix to Subpart EEE ("Quality Assurance Procedures for Continuous Emissions Monitors Used for Hazardous Waste Combustors").

Subsequent CEMS certification will take place in accordance with the normal schedule followed by the facility. This normal schedule includes daily calibrations, quarterly CGAs and annual RATA in accordance with the regulations.

5.0 Sample Custody

A variety of activities are performed prior to and during the field sampling program to ensure proper sample collection, documentation, and sample transport. These activities include equipment calibration, sample media preparation, cleaning of sample train glassware, preparation of computer-generated sample labels, and other miscellaneous tasks. Each of these activities are described or referenced in the following subsections. Other pre-sampling activities include such details as team meetings, equipment packing and shipment, equipment setup, and finalization of all details leading up to the coordinated initiation of the sampling program.

5.1 Field Sampling Operations

5.1.1 Glassware Preparation

Sample train glassware and sample containers require specialized pre-cleaning to avoid contamination of the sample from the collection container or devices. Cleaning/storage procedures for sample train glassware are summarized below. Note that all bottle caps are fitted with Teflon liners which are cleaned in the same manner as the bottles themselves. Sample containers used for all waste feed and stack gas samples are purchased pre-cleaned and sealed to specified EPA protocols (PC class).

- **EPA Method 0023A glassware and containers (PCDDs/PCDFs)** - wash with soap and water, rinse three times with deionized (DI) water, bake at 400°C for 2-hours, rinse three times with pesticide grade methylene chloride, rinse three times with pesticide grade toluene and air dry. Open ends will be sealed prior to shipment to the field with clean aluminum foil.
- **EPA Method 29 glassware and containers (metals)** – wash with soap and water, rinse with hot tap water, and rinse three times with reagent water. The glassware is next soaked in a 10% nitric acid solution for a minimum of 4-hours, rinsed three times with reagent water, rinsed a final time with acetone and air dried. All glassware openings where contamination can occur will be covered with paraffin until the sampling train is assembled prior to sampling.
- **EPA Methods 5 and 26A glassware and components (PM and HCl/Cl_2)** – wash with soap and water, rinse three times with deionized (DI) water and air dry. Open ends will be sealed prior to shipment to the field with paraffin.
- **RM0030** - The glass resin tubes and condensers should be cleaned with a nonionic detergent in an ultrasonic bath, rinsed well with organic-free water, and dried at 110EC. Resin tubes of the I/O design should be assembled prior to storage as described in Paragraph 4.1. Resin tubes of the I/I design can be stored in glass culture tube containers with cotton cushioning and Teflon-lined screw caps. Condensers can be capped with appropriate end caps prior to use.

5.1.2 Sample Labels and Sampling Checklists

Preprinted sample identification labels are used to ensure that all required information is fully documented. When sample batches are shipped to the specified laboratory, a sample packing list (chain-of-custody form) such as that shown in **Figure 5-1** accompanies the shipment. This form is based on established laboratory format and will be used to document sample transfer in the field and from sampling personnel to the laboratory. CK prepares sample labels prior to mobilizing to the field.

Figure 5-1 Sample Packing List and Sample Label

Sample Packing List

Site of Program:	**Sample Date:**	**Project Location:**
Type of Program:	**Date Shipped:**	**Analytical Lab:**
Project #:	**Shipper:**	**Lab P.O. #:**
Program Office:	**Contact:**	**FedEx Air Bill #:**

Sample ID	Sample Matrix	Sample Description	Analyses	Instructions

Field Notes/ Comments

Relinquished By:	Date:	Received By:	Date:	**Analytical Laboratory Destination:**
Signature:	Time:	Signature:	Time:	

EXAMPLE SAMPLE LABEL

Site of Program: __________
Project No.: __________
Sample Date:
Analytical Parameters: __________ Sample Matrix: __________
Sampler: __________

Sample Description: __________
Sample ID Code: __________
Special Instructions: __________

5.1.3 Preliminary Measurements

Preliminary tests will be conducted at the stack location to verify the presence or absence of cyclonic flow conditions and to determine flue gas moisture, temperature, and velocity. These measurements facilitate determination of nozzle size selection and sample train operation rates for the isokinetic sampling trains.

5.1.4 Field Documentation

The field team leader will maintain a field log of all daily activities including facility preparations, sample run times, problems encountered, any corrective actions taken, and other important events related to ash or POHC spiking or equipment operation. The field log will be included in an appendix of the final report.

All materials such as field and laboratory notebooks and logbooks, field and laboratory data records, correspondence, reports, sample tags, traceability records and instrument printouts will be clearly labeled with the project number and become a permanent part of the project file. Project samples will be disposed of in an appropriate manner 60 days after acceptance and approval of a final report. All project-related documentation at CK and the subcontractor laboratories will be kept on file for 2 years following submittal of the final report.

5.2 Field Laboratory Operations

5.2.1 Sample Media Preparation

All reagents will be purchased new with manufacturer purity certifications to minimize the probability of using contaminated solvents. This includes the use of the proper grade reagents/solvents as specified in the test method, selection of reagents from the same lot and the collection and analysis of the appropriate blanks. Bureau Veritas Laboratories will supply CK with sampling media procured and prepared in accordance with the appropriate test methods as described below:

- **XAD resin** used in the Method 0023A sampling train is purchased new and packed in specially designed sorbent traps by BV. All glass cleaning and sorbent packing procedures will follow the protocols specified in EPA Method 0023A.
- **Teflon filters** used in the Method 26A sampling train will be supplied by BV with the method required technical specifications and efficiency ratings.
- **Quartz filters** used in the Method 29 sampling train will be supplied by BV and pre-screened for metals content.

5.2.2 Field Laboratory Facility

Norlite will provide an office space/work area or mobile trailer to serve as a clean area for equipment staging, sample train setup and recovery, team meetings and to serve as the central area for coordinating testing activities and interacting with facility and Agency personnel. Special areas will be established in this trailer for setting up and recovering the isokinetic sampling train and/or for performing preliminary equipment checks. The use of special designated areas for each sampling train will help to eliminate sample train cross-contamination and ensure that the appropriate solvents and reagents are kept in their own specific area for use on the sampling train intended.

5.2.3 Sample Storage

Sample integrity will be maintained throughout all phases of the sampling and analysis program. Samples will be held within sight of the samplers or sample custodian or will be kept in sealed or secured containers at all times. Sealed coolers will be used to transport samples. Samples will be transported to BV via laboratory courier. Samples for Adirondack Laboratories will be hand delivered by Norlite personnel.

5.2.4 Sample Shipment

The CK field team leader will coordinate the packing and transport of all samples. Sample Chain-of-Custody forms, specifically designed for this program, will be generated prior to the field effort. These sheets will assist in assuring that all samples have been collected, accounted for, and shipped under sample traceability documentation to the appropriate laboratory.

5.2.5 Sample Preservation and Holding Times

All samples will be kept on ice in method-specific coolers until they are ready for shipment to the designated laboratory. As stated earlier, these samples will be transported in sealed coolers. **Table 5-1** below provides additional requirements pertaining to sample preservation and recommended holding times.

Table 5-1 Sample Preservation and Holding Time Requirements

Stack Gas Samples [a]

Parameter	Matrix	Preservation	Holding Time
PCDDs/PCDFs (Method 0023A)	XAD Resin	Cool, 4°C	30 days (to extraction)
			45 days (extraction to analysis)
Mercury (Method 29)	Aqueous	N/A	28 days
	Solid/Filter	N/A	28 days
Non-Mercury Metals (Method 29)	Aqueous	N/A	6 months
	Solid / Filter	N/A	6 months
HCl / Cl_2 (Method 26A)	Aqueous	N/A	30 days
RM 0030	Tenax Charcoal	Cool, 4°C	30 days
[a] **Holding times will be calculated from the day of sample collection.**			

Waste Feed Samples

Parameter	Matrix	Preservation	Holding Time
Metals	Aqueous Liquid	Cool	6 months
Metals - Mercury	Aqueous Liquid	Cool	28 days

Total Chlorine	Aqueous Liquid	Cool	30 days

6.0 Field Equipment Calibration Procedures and Frequency

A very important aspect of pre-sampling preparations is the inspection and calibration of all equipment planned to be used for the field effort. Equipment is inspected for proper operation and durability prior to calibration. Calibration of equipment is conducted in accordance with the procedures outlined in the EPA document entitled "Quality Assurance Handbook for Air Pollution Measurement Systems; Volume III—Stationary Source Specific Methods" (EPA/600/R-94/038c, September 1994). Equipment calibration is performed in accordance with EPA guidelines and/or manufacturer's recommendations. Documentation of all calibration records will be kept in the project file during the field program and will be available for inspection by test observers. Recommended practices from the QA Handbook for field equipment to be used during this program and specific calibration procedures performed by CK are listed below.

- **Sampling Nozzles** [QA Handbook Section 3.4.2, pg. 19 - make three measurements of the nozzle ID (to the nearest 0.001 in.) using different diameters with a micrometer. Difference between the high and low values should not exceed 0.004 in. Post-test check - inspect for damage.] Each glass nozzle is calibrated with a micrometer prior to testing and identified with a unique ID number. Any stainless-steel nozzles used during the program are calibrated onsite prior to testing.
- **Pitot Tubes** [QA Handbook Section 3.1.2, pp. 1-13 - measured for appropriate spacing and dimensions or calibrate in a wind tunnel. Rejection criteria given on the calibration sheet. Post-test check - inspect for damage.] Each S-type stainless steel Pitot tube used is designed to meet geometric configurations as defined in EPA Method 2.
- **Thermocouples** [QA Handbook Section 3.4.2, pp. 15-18 - verify against a mercury-in-glass thermometer at two or more points including the anticipated measurement range. Acceptance limits - impinger ±2°F; DGM ±5.4°F; stack ±1.5 percent of stack temperature.] The Type K thermocouples in each meter control box, heated sample box, impinger umbilical connector, XAD resin trap, and sample probe are calibrated against ASTM mercury-in-glass thermometers at two or more points: an ice bath, ambient temperature and a boiling water bath.
- **Dry Gas Meters** [QA Handbook Section 3.4.2, pp. 1-12 - calibrate against a wet test meter or calibrated orifice. Acceptance criteria - pretest Yi = Y ± 0.02; post test Y = ± 0.05 Yi.] Dry gas meters for all sampling trains are calibrated using critical orifices. The procedure entails four runs using four separate critical orifices running at an actual vacuum 1-2 in. greater than the theoretical critical vacuum. The minimum sample volume required per orifice is 5 ft^3. Meter boxes are calibrated annually and then verified by use of the alternative Method 5 post-test calibration procedure. This procedure is based on the principles of the optional pretest orifice meter coefficient check outlined in Section 4.4.1 of Method 5. The average Y-value obtained by this method must be within 5% of the initial Y-value.
- **Field Balance** The analytical balance used in the field to determine initial and final silica gel weights is calibrated against Class M weights provided by the Mettler Corporation (or equivalent).
- **Field Barometer** [QA Handbook Section 3.4.2, pp. 18-19 - compare against a mercury-in-glass barometer or use Airport Station BP and correct for elevation. Acceptance criteria - ± 0.02 in. Hg; post-test check - same.] In the absence of pressure readings from an onsite laboratory or other weather station, BP readings will be obtained from the closest airport and corrected for elevation (-0.10 in. Hg per 100-ft of elevation increase as per Section 6.1.2 of EPA Reference Method 5).

- **CEMS Equipment and Instrumentation** – Although not planned for this field program, should any CEMS equipment be brought to the site, it will be housed in a dedicated trailer that is transported to the test site and set up adjacent to the sampling location. All equipment (analyzers, calibration gases and ancillary equipment) is thoroughly checked prior to each job and the appropriated calibration standards are procured. Daily calibrations and other instrument bias checks are performed in accordance with the specific method followed.

All field equipment is calibrated annually or more often if problems occur. Copies of all calibration data for the equipment to be used on this test will be brought to the test site and a copy will be made available to the test observer, if requested. All calibration data are also subsequently included in the final report appendices.

7.0 Analytical Methods and Procedures

This section delineates the analytical protocols that will be followed to analyze samples during this test program. The methods cited will be followed as written unless specific modifications are made in the laboratory's standard operating procedures (SOPs). Samples of kiln feed materials and stack gas will be collected and analyzed for the parameters previously discussed using the appropriate laboratory protocols detailed in this section and as outlined previously in Section 6.0 of the CPT Plan. All methods will be EPA methods, unless noted otherwise.

Table 7-1 below provides a detailed summary of the overall sampling and analysis program including the number of field, QA/QC and audit samples anticipated for the program. Appropriate accreditations and/or certifications for each analytical laboratory are provided in **Appendix D** of this document.

Table 7-1 Detailed Overview of Sampling and Analysis Program – per Kiln per Condition

Stream / Sampling Method	Analytical Parameters	Analytical Method	Lab **(a)**	Total Samples Analyzed				
				Field	Field Blanks	Audit	Lab QC	Total
Liquid Feeds [LLGF and Used Oil (if fed)] --								
Grab / Composite	Mercury	EPA M 7471B &	ADIR	3	0	0	2	5
	Other Metals **(b)**	EPA M 3051A/6010C	ADIR	3	0	0	2	5
	Density	Gravimetric **(c)**	ADIR	3	0	0	1	4
	Total Chlorine	EPA M 5050 EPA M 9253	ADIR	3	0	0	2	5
	Ash Content	ASTM D 482-13	ADIR	3	0	0	1	4
	Sediment	ASTM D 1796-97 **(d)**	ADIR	3	0	0	1	4
	Heat Content	ASTM D 240-17	ADIR	3	0	0	1	4
Shale --								
Grab / Composite	Mercury	EPA M 7471B	ADIR	3	0	0	2	5
	Other Metals **(b)**	EPA M 3051A/6010C	ADIR	3	0	0	2	5
	Total Chlorine	EPA M 5050 / 9056A	ADIR	3	0	0	2	5
Stack Gas --								
EPA M 5	PM	EPA M 5	BV	3	1	0	0	4
EPA M 26A	HCl and Cl_2	EPA M 26A	BV	3	1	1	2	7
EPA M 0023A	PCDDs/PCDFs	EPA M 0023A	BV	3	1	0	2	6
EPA M 29	Mercury	EPA M 29	BV	3	1	1	2	7
EPA M 29	Other Metals (b)	EPA M 29	BV	3	1	1	2	7
EPA M 3A	O_2 & CO_2	EPA M 3A (CEMS)	NORL	3	0	0	0	3
EPA 0025A/18	VOC	EPA 0025A/18	CK	3	0	0	0	3
RM 0030	VOC	RM 0030	BV	3	1	0	1	5
Facility CEM	O_2 and CO	Facility CEM QA Plan	NORL	3	0	0	0	3

(a) Laboratories identified as follows:
ADIR = Adirondack Environmental Services in Albany, NY
NORL = Norlite onsite laboratory.
BV = Bureau Veritas Laboratories
(b) Other metals: arsenic, beryllium, cadmium, chromium, and lead (MACT)
(c) Density determination will be in accordance with Norlite's analytical SOP # 04-012.
(d) Sediment determination will be in accordance with Norlite's analytical SOP # 04-049.

7.1 Analysis of Kiln Feed Materials

Analyses to determine the chemical and physical properties and metals content of the kiln feed materials will be performed using appropriate ASTM or EPA analytical methods as summarized in **Table 7-2** below. Quality assurance requirements for these determinations are summarized in **Tables 7-3 and 7-4**.

Table 7-2 Sampling and Analytical Summary for LLGF and Shale

Analytical Parameter	LLGF	Shale
Total Chlorine	EPA M 5050 (Prep) EPA M 9253 (Silver Nitrate Titration)	EPA M 5050 (Prep) EPA M 9056A (IC)
Mercury	EPA M 7471B	EPA M 7471B
Other Metals	EPA M 3051A (Prep) EPA M 6010C	EPA M 3051A (Prep) EPA M 6010C
Sediment	ASTM D 1796-97 (Norlite SOP # 04-049)	Not Applicable
Ash Content	ASTM D 482-13	Not Applicable
Density	Gravimetric (Norlite SOP # 04-012)	Not Applicable
Heat Content	ASTM D 240-17	Not Applicable

Table 7-3 QA/QC Procedures for Total Chlorine in Kiln Feed Materials

Quality Parameter	Method Determination	Frequency	Target Criteria
Calibration	Initial analysis of blank plus 3 standards	Prior to sample analysis	Instrument dependent. Linear correlation coefficient >=0.995
	Continuing calibration standards	Before and after sample analysis; once per batch	90%-110% of expected value
Accuracy - calibration	Analysis of calibration check standard	After every calibration	90%-110% of expected value
Accuracy - spikes	Spike sample at twice sample level	Once every 20 samples	80% to 120% of expected value
Accuracy – SRM	Analysis of a standard reference material (SRM)	Once per test	90% to 110% of reference value
Precision	Duplicate preparation and analysis of at least one run's samples	Once per waste stream	10% RPD
Blank	Method blank carried through all sample preparation and analysis steps	Once per batch	Below detection limit

Table 7-4 QA/QC Procedures for Metals in Kiln Feed Materials

Quality Parameter	Method Determination	Frequency	Target Criteria
Calibration	Initial analysis of standards at different concentration levels	At least once before sample analysis	Instrument-dependent. Linear correlation coefficient >=0.995
	Continuing mid-range calibration standard	Before and after sample analysis	80% to 120% of expected value for GFAA and CVAA. 90% to 110% of expected value for ICAP
Interference check	Interference check sample	Before ICAP analysis	80% to 120% of expected value
Accuracy – calibration	Analysis of calibration check standard	After every initial calibration	90% to 110% of expected value
Accuracy – spikes (pre-digestion)	Aliquot of one sample from a run spiked with analytes at 3 times the detection limit or twice the sample level prior to digestion **(a)**	One per sample matrix	70% to 130% recovery
Accuracy – SRM	Analysis of NIST standard reference material (SRM)	Once per matrix	80% to 120% of stated reference value
Precision	Duplicate preparation and analysis of one sample from each matrix	One per sample matrix	Range < 35% if sample result above lowest standard
Blank	Method blank carried through all sample preparation and analysis steps	Once per sample batch	Below detection limit

GFAA = graphite furnace atomic absorption

CVAA = cold vapor atomic absorption

ICAP = inductively coupled argon plasma

(a) The initial spiking level will be approximately 3 times the detection limit. If spike recoveries are not acceptable due to matrix interference, the analysis will be repeated with spiking levels at twice the sample concentration.

7.2 Analysis of Stack Gas Samples

7.2.1 PCDDs / PCDFs in Stack Gas Samples

Stack flue gas samples collected using the Method 0023A sampling train will be analyzed for polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDDs/PCDFs) by BV. Each sampling train will be prepared and split appropriately as specified in Method 0023A. Separate front half and back half analyses will be performed.

Method 0023A analyses (which include high resolution GC/MS as per EPA Method 0023) incorporate five isotopically labeled PCDD and PCDF field surrogates and nine labeled PCDD/PCDF internal standards. **Table 7-5** summarizes the spiking quantities for all standards and surrogates for this program. Working level solutions are prepared from purchased certified NIST traceable individual stock solutions or mixes, when available for each type of standard listed in Table 7.5.

Prespike (PS) or Surrogate Standard:

Each individual compound is purchased as a concentrated solution at 50ug/ml and diluted accordingly to make a working level solution at 100pg/uL. 20uL of the working level solution is added per split to the media (XAD resin) prior to shipping out for sampling. Prespike (PS) or surrogate standards are measured relative to the internal standards and are a measure of the collection efficiency

Native:

Tetra to Hepta Dioxin mix at 25ug/mL, Tetra to Hepta Furan mix at 25ug/mL, OCDF at 50ug/mL and OCDD at 50ug/mL are combined to make a working level solution at 250pg/uL for the Tetra to Hepta dioxin and furans and 500pg/uL for the OCDF and OCDD.

5uL of the working level standard is added prior to extracting the OPR and OPR Duplicate. The OPR and OPR duplicate are used to demonstrate the precision and accuracy associated with laboratory procedures, but, not with sample collection.

Internal (Labeled Standard):

Individual stock 13C labeled congeners at 50ug/mL are combined to make a working level Internal standard at 100pg/uL for each of the Tetra to Hepta labeled congeners and 200pg/uL for labeled OCDD.
13C-12 OCDF is not added as per EPA Method 23. OCDF results are recovery corrected using 13C-12 OCDD.

20uL of the working level standard is added to each of the QC and client samples prior to extraction. These are used to quantify the PCDD's and PCDF's present in the sample, as well as to determine the overall method extraction efficiency.

Cleanup (Alternate Standard):

Stock solution is purchased at 50ug/mL and is diluted to prepare a working standard at 100pg/uL.

20uL of the working level alternate standard is added to the concentrated extract following extraction just prior to beginning the chromatographic cleanup steps. This serves to indicate if any losses may have occurred during the cleanup steps.

Recovery Standard (Injection Standard):

Individual 13C labeled stock solutions @ 50ug/mL are combined to make an Injection / Recovery standard at 100pg/uL. 20uL of this recovery (injection) standard is added to each cleaned up extract just prior to injecting for analysis on the HRGC/ HRMS. This serves to correct the internal standard recoveries for instrument response and any injection variability encountered.

QA/QC requirements for these analyses are summarized in **Table 7-6.**

Table 7-5 Standard Spiking Requirements for Method 0023A

Type of Standard	Time of Addition	Analytes	Amount Added (pg/SPLIT)
Prespike (PS)	Prior to sampling	37Cl4-2,3,7,8-TCDD	2000
		13C-2,3,4,78-PeCDF	2000
		13C-1,2,3,4,7,8-HxCDD	2000
		13C-1,2,3,4,7,8-HxCDF	2000
		13C1,2,3,4,7,8,9-HpCDF	2000
Native	Prior to extraction (OPR only)	2,3,7,8-TCDD	1250
		2,3,7,8-TCDF	1250
		1,2,3,7,8-PeCDD	1250
		2,3,4,7,8-PeCDF	1250
		1,2,3,7,8-PeCDF	1250
		1,2,3,4,7,8-HxCDD	1250
		1,2,3,6,7,8-HxCDD	1250
		1,2,3,7,8,9-HxCDD	1250
		1,2,3,4,7,8-HxCDF	1250
		1,2,3,6,7,8-HxCDF	1250
		1,2,3,7,8,9-HxCDF	1250
		2,3,4,6,7,8-HxCDF	1250
		1,2,3,4,6,7,8-HpCDD	1250
		1,2,3,4,6,7,8-HpCDF	1250
		1,2,3,4,7,8,9-HpCDF	1250
		OCDD	2500
		OCDF	2500
Internal (IS)	Prior to extraction	13C-2,3,7,8-TCDD	2000
		13C-2,3,7,8-TCDF	2000
		13C-1,2,3,7,8-PeCDD	2000
		13C-1,2,3,7,8-PeCDF	2000
		13C-1,2,3,6,7,8-HxCDD	2000
		13C-1,2,3,6,7,8-HxCDF	2000
		13C-1,2,3,4,6,7,8-HpCDD	2000
		13C-1,2,3,4,6,7,8-HpCDF	2000
		13C-OCDF	Not added
		13C-OCDD	4000
Cleanup (AS)	Before cleanup	13C-1,2,3,7,8,9-HxCDF	2000
Recovery	Prior to analysis	13C-1,2,3,4-TCDD	2,000
		13C-1,2,3,4-TCDF	Not added
		13C-1,2,3,7,8,9-HxCDD	2,000

Table 7-6 QA Objectives for PCDD/PCDF Analysis of Stack Gas Samples

Quality Parameter	Method Determination	Frequency	Target Criteria
Calibration	Five-level calibration curve; continuing calibration standard	At least once, continuing calibration check at beginning of each 12-hr shift	Initial: <=25% RSD for unlabelled standards <=30% RSD OCDD <=25% RSD for TCDD and HxCDD internal standards <=30% Remaining Internal Standards **Reference: Table 3.4-5 Method 23 (40 CFR Ch.1 (7-1-91 Edition)** S/N ratio >=10 Isotope ratios within control limits **Reference: Table 3.4-3 in EPA Method 23 (40 CFR Ch.1 (7-1-91 Edition)** Continuing: <=25% of ICAL for 16 unlabeled stds <=30% of ICAL for unlabeled OCDD, OCDF <=25% of ICAL for Tcdd and HxCDD internal standards <=30% of ICAL for remaining **Reference: Table 3.4-5 Method 23 (40 CFR Ch.1 (7-1-91 Edition)** Internal standards S/N ratio >=10; Isotope ratios within control limits **Reference: Table 3.4-3 in EPA Method 23 (40 CFR Ch.1 (7-1-91 Edition)**
Accuracy-calibration	Analysis of calibration check	After every initial calibration	80% - 120% of theoretical value
Accuracy-surrogates	Spiked into samples prior to sampling	Every sample	70% - 130% recovery
Accuracy-internal standards	Spiked into samples prior to extraction and analysis	Every sample	40%-130% recovery for tetra – octa homologs
Accuracy – audit samples	Prepared and analyzed along with program samples	Presented by the regulatory agency	Determined by regulatory agency

Table 7-6 QA Objectives for PCDD/PCDF Analysis of Stack Gas Samples (Continued)

Blanks	Method blank for each component Field blank	One per batch of samples Once per test	< RDL or <5% of field concentration Evaluated on a case-by-case basis
Mass Spectrometer Performance	Section 9.3.2 of Method 8290	At the beginning and end of each 12-hr period	Static resolving power of 10,000 (10% valley definition)
GC Performance	Retention Time and GC Column Performance	At the beginning of each 12-hr period	Compliance with Section 9.3.1 of Method 8290- Same for M23
Qualitative Identification	Identification Criteria	Every sample	Compliance with Section 11.8.4 of Method 8290. Same for M23

S/N = Signal to Noise Ratio
RSD = Relative Standard Deviation

7.2.2 Metals in Stack Gas Samples

Each sampling train will be prepared and recovered by CK. Samples will be analyzed by BV in accordance with EPA Reference Method 29. Target parameters will be reported separately in each sample train fraction (as outlined below) and blank- corrected in accordance with method-specific procedures.

From each sampling train, seven individual samples are generated for analysis. The first two samples, labeled Fractions 1A and 1B consist of the digested sample from the front half of the train, consisting of the particulate filter and the front-half nitric acid probe rinse. Fraction 1A is for inductively coupled argon plasma emission spectroscopy (ICAP) analysis and Fraction 1B is for mercury analysis. Fractions 2A and 2B consist of digestates from the moisture knock out and HNO_3/H_2O_2 impingers 1, 2, and 3. Fraction 2A is for ICAP analysis and Fraction 2B is for mercury analysis. Fractions 3A, 3B, and 3C consist of the impinger contents and rinses from the empty and permanganate impingers 4, 5, and 6. These fractions will be analyzed for mercury.

Mercury analysis will be performed using EPA Method 7470A (SW-846, 3rd Edition). All quality control procedures, including the interference check standard, will be followed as described in the method.

Instrument calibration will be performed daily in accordance with the procedures described in Method 6020B and the manufacturer's instructions. The calibration is verified daily by analysis of an instrument check standard prepared from an EPA quality control concentrate or another independent standard.

QA/QC requirements for the analysis of metals in stack gas samples are summarized in **Table 7-7**.

Table 7-7 QA Requirements for Metals in Stack Gas by ICP-MS and CVAAS

Quality Parameter	Method Determination	Frequency	Target Criteria
Calibration	Continuing mid-range calibration standard	At least once before and after sample analysis	90-110%
	Continuing calibration blank	With continuing calibration standard	Subject to interpretation
Accuracy - ICV	Analysis of calibration check standard	After every initial calibration	90% to 110% of true value
Accuracy - filters	Analysis of EPA audit filters, if provided	Once per test	70% to 130% of reference value
Accuracy	LCS / LCSD	Once per test	As per lab's historical limits
Precision	LCS / LCSD	Once per test	RPD < or = 20%
Blanks	Field Reagent Blanks and Method Blanks	One each per test	Evaluated on case by case basis

RPD = Relative Percent Difference LCS = Lab Control Sample LCSD = Lab Control Sample Duplicate

7.2.3 Hydrogen Chloride and Chlorine in Stack Gas Samples

Impinger samples from the Method 26A sampling train will be analyzed by Bureau Veritas Laboratories (BV) by ion chromatography in accordance with EPA Method 26A.

The sodium hydroxide impinger samples are treated with sodium thiosulfate in the laboratory, the pH of the solution is adjusted to >9 by adding NaOH (10N) drop wise. The samples are treated with sodium thiosulfate by adding 20 μL sodium thiosulfate (1.0N). If the final dilution required exceeds 500, the sample is re-prepared by adding 20 μL sodium thiosulfate (1.0N) for each 500-fold dilution. QA/QC procedures for these analyses are presented in **Table 7-8**.

Table 7-8 QA Requirements for Chlorides in Stack Gas

Quality Parameter	Method Determination	Frequency	Target Criteria
Calibration (Qualitative)	Average retention time	Every calibration curve	Within retention time window of standards
Calibration (quantitative)	Initial calibration with a minimum of four standards	At least once before sample analysis	Quadratic Correlation coefficient > 0.995
	Continuing calibration	Every 10 samples and at end of day	90% - 110% of theoretical concentration
Accuracy (calibration)	Laboratory control sample	Before sample analysis	90% - 110% of true value
Accuracy (spikes)	Matrix spikes	Once per test	70% - 130% recovery
Precision	Duplicate analyses	All samples	RPD < or = 35%
Field Reagent Blanks	Collection of method-specified volumes of each reagent	Once per test	Less than 5% of sample levels
Blank	One method blank carried through sample preparation and analysis	Once per test	Less than 5% of sample levels
RPD = Relative Percent Difference			

7.2.4 Particulate Matter in Stack Gas Samples

Gravimetric analyses will be performed by BV on samples collected from the Method 5/26A PM/HCl/Cl_2 train. Weights will be obtained on the front-half acetone rinse and particulate filter using a calibrated analytical balance. Balance accuracy is checked by using Class "S" standard weights before and after tare weighing and sample determinations. Sample fractions are dried to constant weight, defined as two successive weighings at a 6-hr interval showing a weight change of less than 0.5 mg.

7.2.5 VOCs in Stack Gas Samples

Volatile Organic Constituents will be performed using two methods. EPA 0025A/18 is an instrumentation method that will be performed on site by CK environmental. RM 0030 will be performed by BV on samples collected during the test run. This method employs a 20-liter sample of effluent gas containing volatile POHCs which is withdrawn from a gaseous effluent source at a flow rate of 1 L/min, using a glass-lined probe and a volatile organic sampling train (VOST). The gas stream is cooled to 20EC by passage through a water-cooled condenser and volatile POHCs are collected on a pair of sorbent resin traps. Liquid condensate is collected in an impinger placed between the two resin traps. A total of six pairs of sorbent traps may be used to collect volatile POHCs from the effluent gas stream.

8.0 Quality Control Procedures

Quality control checks will be performed to ensure the collection of representative samples and the generation of valid analytical results for these samples. These checks will be performed by project participants throughout the program under the direction of the Project Manager and the QA Officer.

8.1 Field Sampling QC Procedures

QC checks for the process data collection and sampling aspects of this program will include, but not be limited to, the following:

1. Use of standardized data sheets, checklists and field notebooks to ensure completeness, traceability, and comparability of the process information and samples collected.

2. Field checking of standardized forms by the Field Team Leader and a second person to ensure accuracy and completeness.

3. Strict adherence to the sample traceability procedures.

4. Submission of field biased blanks.

5. Leak checks of sample trains before and after sample collection and during the test, when appropriate.

8.1.1 Equipment Inspection, Maintenance and Calibration

CK maintains a dedicated facility for storage, maintenance, repair, and calibration of all field equipment. Prior to each job, project participants fully inspect and prepare all equipment that will be used.

Calibration of the field sampling equipment is performed in accordance with procedures recommended by the manufacturer and as described earlier in Section 6.0. Copies of the calibration sheets will be available onsite during the field sampling program for inspection, will be kept in the project file and will be incorporated as an appendix in the final report. Calibrations will be performed as described in the EPA publication "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods;" Section 4.2.1 presents acceptance limits.

8.1.2 Sampling Equipment QC Checks and Frequency

Leak checks of the sample trains will be conducted in accordance with the protocol called out for each method. Leak checks will be conducted prior to and at the end of sample collection and during the test run, if the sampling train is disassembled for any reason or if the port change requires extensive movement of the train.

Field blanks of reagents and collection media (deionized water, filters, impinger solutions, sorbent material, etc.) will be placed in appropriately cleaned and sized sample containers in the field and handled in the same way as actual field samples, to provide a QC check on sample handling.

For this program, sample collection QC checks and frequency for samples to be analyzed in the laboratory are listed below:

- One set of reagent/media blanks from the Method 0023A (PCDDs / PCDFs) sampling train
- One set of reagent/media blanks from the Method 29 (metals) sampling train
- One set of reagent/media blanks from the Method 26A (PM, HCl / Cl 2) sampling train

8.2 Analytical QC Procedures

The Quality Control program for laboratory analysis makes use of several different types of QC samples to document the validity of the generated data. The following types of QC samples will be used during the program.

8.2.1 Quality Control Samples and Blanks

<u>Method Blanks</u>

Method blanks contain all the reagents used in the preparation and analysis of samples and are processed through the entire analytical scheme to assess spurious contamination arising from reagents, glassware, and other materials used in the analysis.

<u>Calibration Check Samples</u>

One of the working calibration standards which is periodically used to check that the original calibration is still valid.

<u>Laboratory Control Samples (LCS) or Blank Spikes</u>

These samples are generated from spikes prepared independently from the calibration concentrates. The LCS are used to establish that an instrument or procedure is in control. An LCS is normally carried through the entire sample preparation and analysis procedure also.

<u>Surrogate Spikes</u>

Samples requiring analysis by GC/MS are routinely surrogate spiked with a series of deuterated analogues of the components of interest. It is anticipated that these compounds would assess the behavior of actual components in individual program samples during the entire preparative and analysis scheme.

The percent recovery for each surrogate will be calculated in accordance with method-specific procedures. Any values which fall outside the target QC limits described in the applicable analytical method will be flagged. Some of these recovery values may be outside the QC limit owing to matrix interferences. The following guidelines will be used:

1. All recovery data are evaluated to determine if the QC limits are appropriate and if a problem may exist even though the limits are being achieved (e.g., one compound that is consistently barely within the lower limit).

2. Any recovery data which are outside the established limits are investigated. This evaluation will include an independent check of the calculation.

3. Corrective action will be performed if any of the following are observed:

   - All recovery values in any one analysis are outside the established limits, where one analysis is one sample analyzed by one method,
   - Over 10 percent of the values for a given sample delivery group are outside limits, or
   - One compound is outside the limits in over 10 percent of the samples.

An analysis batch is defined as a group of ten or fewer samples carried through the entire preparation and analysis procedure in one batch.

Reagents used in the laboratory are normally of analytical reagent grade or higher purity; each lot of acid or solvent used is checked for acceptability prior to laboratory use. All reagents are labeled with the date received and date opened. The quality of the laboratory deionized water is routinely checked. All glassware used in the sampling and analysis procedures will be pre-cleaned according to the method requirements. Standard laboratory practices for laboratory cleanliness, personnel training and other general procedures are used. The results of these quality control procedures will be included in the final report.

9.0 Performance and System Audits

The sampling, analysis, and data handling segments of a project are checked in performance audits. A different operator/analyst prepares and conducts these audit operations to ensure the independence of the quantitative results.

EPA Quality Control concentrates or other standards will be used to assess the analytical work. Results will be reviewed by the subcontractor laboratory and QC personnel. CK will obtain commercially available audit samples from accredited audit sample provider and are evaluated during the performance test program. Audit samples as identified in Section 2.3 and **Table 7.1** will be analyzed along with program samples, by the appropriate lab and at the same time as all other samples. Per the audit program, the results of these audits will be reported to the NYSDEC.

If the regulatory agency advises facility program manager that audit results fall outside of acceptable ranges, the analytical data will be further reviewed for error in conjunction with the agency. If a simple, correctable error is found (e.g., an arithmetic error), correction will be made, and results resubmitted. If no error is found, an investigation into other causes of the failure (e.g., lack of sample integrity) will be conducted and results evaluated in terms of the impact on sample data integrity.

10.0 Preventive Maintenance

This section provides pertinent information for field sampling equipment as well as a listing of all critical facility equipment necessary to maintain permitted operating conditions and to demonstrate continuing compliance. Information is provided for preventive maintenance and schedules and spare parts for key equipment and instrumentation.

10.1 Field Sampling Equipment

CK follows an orderly program of positive actions to prevent the failure of equipment or instruments during use. This preventive maintenance and careful calibration help to ensure accurate measurements and minimal field delays.

All equipment that is scheduled for field use is calibrated as outlined previously in Section 6.0. Prior to each field use for a specific project, the equipment is cleaned and checked to ensure it is in good working order. An adequate supply of spare parts and sample train glassware is brought to each site to minimize downtime and field sampling delays. Any equipment that does experience problems is appropriately tagged in the field to ensure that it is repaired upon return to the office.

10.2 Facility Equipment and Instrumentation

Norlite performs scheduled and preventative maintenance programs on the process equipment including mechanical, electrical, structural and instrument systems. These programs are designed with predictive maintenance goals to minimize and/or eliminate unscheduled shutdowns. Norlite operators perform daily inspections of equipment as well as perform scheduled preventative maintenance services such as cleaning, oiling, and greasing of components.

11.0 Procedures Used to Assess Data Precision and Accuracy

The QC activities implemented in this program will provide a basis for assessing the accuracy and precision of the analytical measurements. Section 8.0 of this QAPP discusses the various QC activities that will generate the accuracy and precision data for each sample type. A generalized form of the equations that will be used to calculate accuracy, precision and completeness follows.

11.1 Accuracy

Accuracy (calculated as percent recovery) will be determined using the following equation:

$$\%Recovery = \frac{(X - S)}{T} \times 100$$

where:

X = experimentally determined concentration of the spiked sample

T = true concentration of the spike

S = sample concentration before spiking

11.2 Precision

Precision (calculated as percent relative difference) will be determined using the following equation:

Relative Percent Difference (RPD) = ((D1 – D2) / ((D2 + D1)/2)) X 100

where:

D_1 and D_2 = results of duplicate measurements or standard deviation relative to the average value expressed as relative standard deviation:

Relative standard deviation will be expressed as follows:

$$RSD = \frac{s * 100}{x}$$

where:

RSD = Relative standard deviation
s = Standard deviation
x = Mean of the data.

11.3 Completeness

Data completeness is a measure of the extent to which the database resulting from a measurement effort fulfills objectives for data required. For this program, completeness will be defined as the percentage of valid data for the total valid tests. Completeness is assessed using the following equation:

Completeness (%) = (Dr / Dc) * 100

where:

D_r = number of samples for which valid results are reported

D_c = number of valid samples that are collected and reach the laboratory for analysis

The completeness objective will help to evaluate the accuracy and precision of the analytical measurements.

12.0 Corrective Actions

The acceptance limits for the sampling and analyses to be conducted in this program will be those stated in the method or defined by the project manager. The corrective actions are likely to be immediate in nature and most often will be implemented by the analyst or Project Manager; the corrective action will usually involve recalculation, reanalysis, or repeating a sample run. Ongoing corrective action policy is described here.

12.1 Immediate Corrective Action

Specific QC procedures and checklists are designed to help analysts detect the need for corrective action. Often the person's experience will be more valuable in alerting the operator to suspicious data or malfunctioning equipment.

If a corrective action can be taken at this point, as part of normal operating procedures, the collection of poor-quality data can be avoided. Instrument and equipment malfunctions are amenable to this type of action and QC procedures include troubleshooting guides and corrective action suggestions. The actions taken should be noted in field or laboratory notebooks, but no other formal documentation is required, unless further corrective action is necessary. These on-the-spot corrective actions are an everyday part of the QA/QC system.

Corrective action during the field sampling portion of a program is most often a result of equipment failure or an operator oversight and may require repeating a run. When equipment is discovered to be defective (i.e., pre- and post-sampling leak check) it is repaired or replaced, and a correction factor is established as per the EPA method. If a correction factor is unacceptable the run is repeated. Operator oversight is best avoided by having field crew members audit each other’s work before and after a test. Every effort is made by the field team leader to ensure that all QC procedures are followed. Economically, it is preferred to repeat a run during a particular field trip rather than return at a later date.

Corrective action for analytical work would include re-calibration of instruments, reanalysis of known QC samples and, if necessary, of actual field samples.

If the problem is not solved in this way, more formalized long-term corrective action may be necessary.

12.2 Long-Term Corrective Action

The need for this action may be identified by standard QC procedures, control charts, performance or system audits. Any quality problem which cannot be solved by immediate corrective action falls into the long-term category. The condition is reported to a person responsible for correcting it who is part of the closed-loop action and follow-up plan.

The essential steps in the closed-loop corrective action system are:

- Identify and define the problem.
- Assign responsibility for investigating the problem.
- Investigate and determine the cause of the problem.

- Determine a corrective action to eliminate the problem.
- Assign and accept responsibility for implementing the corrective action.
- Establish effectiveness of the corrective action and implement it.
- Verify that the corrective action has eliminated the problem.

Documentation of the problem is important to the system. A Corrective Action Request Form is filled out by the person finding the quality problem. This form identifies the problem, possible causes and the person responsible for action on the problem. The responsible person may be an analyst, field team leader, department QC coordinator or the QA Director. If no person is identified as responsible for action, the QA Director investigates the situation and determines who is responsible in each case.

The Corrective Action Request Form includes a description of the corrective action planned and the date it was taken, and space for follow-up. The QA Director checks to be sure that initial action has been taken and appears effective and, at an appropriate later date, checks again to see if the problem has been fully solved. The QA Director receives a copy of all Corrective Action Forms and then enters them in the Corrective Action Log. This permanent record aids the QA Director in follow-up and makes any quality problems visible to management; the log may also prove valuable in listing a similar problem and its solution.

13.1 Data Reduction, Validation and Data Reporting

Specific QC measures will be used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in all such projects.

13.1 Field Data Reduction

Attachment A presents the standardized forms that will be used to record field sampling data. The Field Team Leader and the QAO will review the data collected from each train in its entirety in the field. Errors or discrepancies will be noted and dealt with accordingly. Both the Field Team Leader and the QAO have the authority to institute corrective actions in the field. Field data reduction (checking of valid isokinetic sampling rate and other sampling parameters) is done with a laptop computer using standardized Excel spreadsheets. **Attachment B** provides both setup and recovery schematics and a description of solutions and reagents to be used in each impinger train required for the overall program. All sample recovery sheets will be checked for completeness.

13.2 Laboratory Data Reduction

Analytical results will be reduced to appropriate units by the laboratory using the equations given in the applicable analytical method. Unless otherwise specified, results from the analysis of liquid waste feed samples for specific target constituents will be reported in units of mg/kg or % wt. Other parameters will be reported in standard units such as g/cc, Btu/lb, etc.

The laboratory typically reports results from the analysis of stack flue gas samples as total mass detected for the sample submitted. For those sample fractions where liquid impinger condensate is analyzed, the laboratory will measure the total liquid volume submitted and multiply by the measured concentrations of target analytes in these samples. The laboratories will report data as follows:

- Particulate matter – total mg collected in each sample train fraction (front-half rinse and filter)
- Metals – total µg collected in each sample train fraction
- PCDDs/PCDFs - total **pg** collected in each of the front-half and back-half sample train fractions
- HCl /Cl_2 – total µg collected in each sample train fraction as either HCl or Cl_2

Each LSC will be responsible for reviewing all results and calculations and verifying the completeness of the data set. The laboratory reports submitted by each laboratory will include the following deliverables:

- Transmittal letter listing all samples and analyses and a case narrative identifying any difficulties associated with the analyses and any anomalous QA/QC results
- Copies of Chain of Custody Forms

- Sample Report forms with sample field and laboratory identifier, dates of sample preparation and analysis, analytical results, and detection limits
- Method Blank results
- MS and MSD results (as applicable)
- Replicate sample analyses (as applicable)
- Laboratory Control Sample results

Reports for organics in stack samples will include the following additional information:

- Surrogate recoveries
- Summary of initial calibrations
- Continuing calibration summaries
- Instrument tunes
- Data Validation

An electronic copy of the raw data, calculations spreadsheets, and analysis is to be submitted with the final report.

13.3 Data Validation

Data validation is the process of reviewing data and accepting, qualifying, or rejecting it based on method-specific criteria. The independent project QAO will use validation methods and criteria appropriate to the type of data and the purpose of the measurement. Records of all data will be maintained, even that judged to be an outlying or spurious value.

Field sampling data will be validated by the Field Team Leader based on a judgment of the representativeness of the sample, maintenance and cleanliness of sampling equipment and the adherence to an approved, written sample collection procedure.

Analytical data will be validated by the subcontractor laboratory QC or supervisory personnel using criteria outlined in their laboratory-specific QA Plan and/or written SOPs. Results from field and laboratory method blanks, replicate samples and internal QC samples will be used to further validate analytical results. Analytical results on field blanks and replicate field samples are valuable for validation of sample collection also. QC personnel will review all subcontractor laboratory raw analytical data to verify calculated results presented.

The following criteria will be used to evaluate the field sampling data:

- Use of approved test procedures
- Proper operation of the process being tested
- Use of properly operating and calibrated equipment
- Leak checks conducted before and after test runs
- Use of reagents that have conformed to QC specified criteria, and

- Use of Protocol 1 CEMS calibration gases
- Proper chain-of-custody maintained
- All sample trains --check to ensure proper sample gas volume collected

The criteria used to evaluate the analytical data are as previously defined in Section 3.0 (data quality objectives) and the method-specific QA summary tables listed in Section 7.0.

13.4 Data Reporting

13.4.1 Preliminary Data Reporting in the Field

At the end of each day of testing, several types of data will be made available to all project participants and test observers. Recovery of each isokinetic sampling train will include spreadsheet calculations to determine proper isokinetic sampling rate, stack gas moisture content, temperature and flowrate and sample volume. These data will be reviewed for acceptability and made available to facility personnel and Agency staff.

13.4.2 Preliminary Reporting of Results

In the weeks following test conclusion, all field data will be reviewed, and spreadsheet data entry will be checked for accuracy and completeness. As laboratory data become available, emission calculations will be performed, and results will be provided to Norlite and Agency personnel. Most importantly, the results of any failed tests will be provided as soon as the data are thoroughly checked for accuracy and associated QC data are determined to be acceptable.

13.4.3 Final Data Report

The final report for this project will be a comprehensive data compilation that properly and logically documents and certifies all required test results. The report will include all the required elements of a MACT NOC as outlined in Section 7 of the CPT Plan. CK plans to follow the guidance provided by EPA for a combined NOC and CPT report. As such, the report would be structured in a similar manner with sections delineated as follows:

- Summary of Test Results
- Introduction and Process Description
- Process Operating Conditions
- Feed Stream Sampling and Analysis
- Performance Test Results
- Quality Assurance / Quality Control Documentation
- Continuing Compliance Methods

Report appendices will also provide detailed supporting documentation as delineated in the above referenced LDEQ guidance. Appendices for the project report would include:

- Process Operating Data

- Field Sampling Documentation
- Sample Calculations
- Analytical Data Reports
- CMS / CEMS performance Evaluation Test Results

An electronic copy of the raw data, calculations spreadsheets, and analysis is to be submitted with the final report.

13.4.4 Management of Non-Detects

There are several different scenarios regarding the handling of analytical data reported as ND in this program. First, for the purposes of determining compliance with feed rate limits that are calculated from analytical data, the full ND value (reporting limit) will be used.

In general, the emission tables to be generated for the final report will perform all calculations using either a real value or the detection limit (i.e. reporting limit) for those parameters reported as ND. Using the full detection limit in an emission calculation provides a worst-case assessment.

When calculating dioxins emission rates, values reported as the detection limit will be handled as zero [63.1208(b)(1)(i)(B)(*3*)(iii)].

13.4.5 Oxygen Correction

In accordance with 63.1206(c)(2)(iii), the facility is required to identify a projected oxygen correction factor based on normal operations to be used during periods of startup and shutdown. Norlite does not presently envision the need to project any alternative correction factor. It should also be noted that all concentration-based emission results will be corrected to 7% oxygen in accordance with the MACT regulations.

13.4.6 Sampling Times and Calculation of Results

Stack gas concentrations for each applicable parameter will be calculated from laboratory results and field sampling data. The total weight of the analyte detected will be divided by the volume of gas sampled to provide emission concentrations. As stated above, all emission concentrations are further corrected to 7% oxygen for comparison to published standards.

13.4.7 Blank Correction

Except for PM samples no other samples collected on this program are allowed to be blank-corrected. PM acetone blank correction will be employed as need as specified in the method.

13.4.8 Rounding and Significant Figures

For purposes of final data reporting, the procedures outlined under 40 CFR 63.1221(d) with respect to rounding of emission results and use of significant figures are proposed. This regulation notes that for all emission parameters except DRE, intermediate calculations must be performed using at least three significant figures, but that the resultant emission levels may be rounded to two significant figures to document compliance.

13.4.9 Evaluating Compliance

To determine compliance with applicable emission standards, the three-run arithmetic average for each target pollutant will be compared to the emission standard for all parameters except DRE. Each DRE run must satisfy limit to demonstrate compliance.

14.0 Quality Assurance Reports

14.1 Internal Reports

The Laboratory Services Coordinator will prepare a written report on QC activities associated with this project for the Quality Assurance Director. This report will detail the results of quality control procedures, problems encountered and any corrective action, which may have been required.

All Corrective Action Forms are submitted to the QA Officer for initial approval of the corrective action planned and a copy is provided to the Program Manager. All system audit reports are provided to the Program Manager and the Quality Assurance Officer.

14.2 Reports to Client

The final report will include a section summarizing QA/QC activities during the program. The Project Manager, Laboratory Services Coordinators and the QA Officer will participate in preparing this section. This section will provide summary QA/QC results for method blanks, surrogate spikes, and laboratory control spike recoveries. This section will evaluate overall data quality in terms of accuracy, precision, and completeness. Any discrepancies or difficulties noted in program work, protocol deviations or documentation gaps will be identified and discussed.

14.3 Regulatory Agency Notifications

NYSDEC will be notified for the purpose of their concurrence if there are any changes to the CPT plan or test methods. The agency will also be notified if any errors or discrepancies are discovered in the field data sheets upon review after returning from the field. Norlite will also notify NYSDEC at least 60 calendar days before the test is scheduled to begin.

ATTACHMENT A

Example Field Datasheets

ANALYZER CALIBRATION SHEET

PLANT: ____________________ DATE: ____________

TEST LOCATION: ____________ OPERATOR: ____________

FUEL: ____________

LOAD:

GAS	RANGE	CYLINDER VALUE	ANALYZER RESPONSE	ABSOLUTE DIFFERENCE	ANALYZER CAL. ERROR
O_2	ZERO	**0.0**			
	MID				
	HIGH				
CO_2	ZERO	**0.0**			
	MID				
	HIGH				
CO	ZERO	**0.0**			
	MID				
	HIGH				
SO_2	ZERO	**0.0**			
	MID				
	HIGH				
NOx	ZERO	**0.0**			
	MID				
	HIGH				

ANALYZER CALIBRATION ERROR (%) = [(ANALYZER RESPONSE - CYLINDER VALUE) / HIGH CYLINDER VALUE] * 100

ERROR MUST NOT EXCEED 2% OR 0.5 PPM ABSOLUTE

Quality Control Check: Completeness______ Legibility______ Accuracy______ Specifications______ Reasonableness______

SYSTEM CALIBRATION SHEET

PLANT: ______________________________ DATE: ______________

TEST LOCATION: ______________________ OPERATOR: ______________

FUEL: ______________________ SYSTEM RESPONSE TIME: ______________

LOAD:

		O_2		CO_2		CO		SO_2		NOx	
		RANGE: ______		RANGE: ______		RANGE: ______		RANGE: ______		RANGE: ______	
		ZERO	SPAN	ZERO	SPAN	ZERO	SPAN	ZERO	SPAN	ZERO	SPAN
	ANALYZER CAL RESPONSE										
	INITIAL SYSTEM CAL RESPONSE										
RUN:______	SYSTEM BIAS										
START TIME:______	FINAL SYSTEM CAL RESPONSE										
	SYSTEM BIAS										
END TIME:______	SYSTEM DRIFT										
	NON CAL. CORR. AVERAGE										
	INITIAL SYSTEM CAL RESPONSE										
RUN:______	SYSTEM BIAS										
START TIME:______	FINAL SYSTEM CAL RESPONSE										
	SYSTEM BIAS										
END TIME:______	SYSTEM DRIFT										
	NON CAL. CORR. AVERAGE										
	INITIAL SYSTEM CAL RESPONSE										
RUN:______	SYSTEM BIAS										
START TIME:______	FINAL SYSTEM CAL RESPONSE										
	SYSTEM BIAS										
END TIME:______	SYSTEM DRIFT										
	NON CAL. CORR. AVERAGE										

SYSTEM BIAS = [(SYSTEM RESPONSE - ANALYZER RESPONSE) / HIGH CYLINDER VALUE] * 100

ERROR MUST NOT EXCEED 5% OR 0.5 PPM ABSOLUTE

SYSTEM DRIFT = [(INITIAL SYSTEM RESPONSE - FINAL SYSTEM RESPONSE) / HIGH CYLINDER VALUE] * 100

ERROR MUST NOT EXCEED 3% OR 0.5 PPM ABSOLUTE

Quality Control Check: Completeness______ Legibility______ Accuracy______ Specifications______ Reasonableness_____

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Field Data Sheet

Run No ______________

Client		Pollutant		Nozzle No. & Dia.		Pitot Coefficient	0.84
Plant		Duct Dia.		Probe ID.		Orifice Delta H @	
Facility		Test Duration		Probe Heat Set		Test Time	Start
City, State		Min. Per Pt.		Filter Temp. Set			Stop
Test Date		Amb Temp		Assumed % H_2O		Train Leak Check	Start CFM@ in. Hg.
Location		Bp @ Test Location		Nomograph K Factor			Final CFM@ in. Hg.
Testers		Filter No.		Dry Gas Meter Y		Pitot Leak Check	Start OK
Meter Box ID						(>3" WC)	Final OK

Stack Static Pressure:

Port	Point	Time min.	Velocity Delta P	Delta H	Gas Vol. ft^3	Temp Stack °F	Temp Prb °F	Filter Box °F	Last Imp (<68˚f) °F	Aux °F	Dry Gas Meter IN	Dry Gas Meter OUT	Pump Vac Hg"
Avg sqrt dP/Avg/ or Total:													

Impinger Catch:

Imp. No.	1	2	3	4	Other	
Final vol/wt.						
Init. vol/wt.						TOTAL
Catch						
	H_2SO_4	H_2SO_4	Empty	Si Gel		

Orsat Analysis

EPA Method 3

O_2	
CO_2	

Field Calculations

As = ________ ft^2

Tstd = 528 R Pstd = 29.92 in. Hg

Ts = 460 + Tstk = ____________R

Ps = Pbar + (Pg/13.6) = ____________in. Hg

Vs = (85.49) x Cp x sqrt(Delta P) x sqrt[Ts/(Ps x MW)]

= ____________ft/sec

Qa = 60 x Vs x As = ____________ACFM

Qstd = Qa x (1-Bws) x (Tstd/Ts) x (Ps/Pstd)

= ____________DSCFM

Pb = Bar. Press. -.1 per 100ft

Notes:

EPA Methods 5/29

Field Data Sheet

Run No ____________

Client		Pollutant		Nozzle No. & Dia.		Pitot Coefficient	0.84
Plant		Duct Dia.		Probe ID.		Orifice Delta H @	
Facility		Test Duration		Probe Heat Set		Test Time	Start
City, State		Min. Per Pt.		Filter Temp. Set			Stop
Test Date		Amb Temp		Assumed % H_2O		Train Leak Check	Start ____ CFM@ ____ in. Hg.
Location		Pb @ Test Location		Nomograph K Factor			Final ____ CFM@ ____ in. Hg.
Testers		Filter No.		Dry Gas Meter Y		Pitot Leak Check	Start ____ OK
Meter Box ID						(>3" WC)	Final ____ OK

Stack Static Pressure:

Port	Point	Time min.	Velocity Delta P	Delta H	Gas Vol. ft^3	Temp Stack °F	Temp Prb °F	Filter Box °F	Last Imp (<68˚f) °F	Aux °F	Dry Gas Meter IN	Dry Gas Meter OUT	Pump Vac Hg"
Avg sqrt dP/Avg/ or Total:													

Impinger Catch:

Imp. No.	1 (K/O)	2	3	4	5	6	7
Final vol/wt.							
Init. vol/wt.							
Catch							
	Empty	H2O2/HNO3	H2O2/HNO3	Empty	KMNO4/H2SO4 (Hg Option)	KMNO4/H2SO4 (Hg Option)	Si Gel

Orsat Analysis

EPA Method 3	
O_2	
CO_2	

Field Calculations

As = ________ ft^2

Tstd = 528 R   Pstd = 29.92 in. Hg

Ts = 460 + Tstk = ____________R

Ps = Pbar + (Pg/13.6) = ____________in. Hg

Vs = (85.49) x Cp x sqrt(Delta P) x sqrt[Ts/(Ps x MW)]

= ____________ft/sec

Qa = 60 x Vs x As = ____________ACFM

Qstd = Qa x (1-Bws) x (Tstd/Ts) x (Ps/Pstd)

= ____________DSCFM

Pb = Bar. Press. -.1 per 100ft

Notes:

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Field Data Sheet

Run No ______________

Client		Pollutant		Nozzle No. & Dia.		Pitot Coefficient	0.84		
Plant		Duct Dia.		Probe ID.		Orifice Delta H @			
Facility		Test Duration		Probe Heat Set		Test Time	Start		
City, State		Min. Per Pt.		Filter Temp. Set			Stop		
Test Date		Amb Temp		Assumed % H_2O		Train Leak Check	Start	CFM@	in. Hg.
Location		Pb @ Test Location		Nomograph K Factor			Final	CFM@	in. Hg.
Testers		Filter No.		Dry Gas Meter Y		Pitot Leak Check	Start	OK	
Meter Box ID						(>3" WC)	Final	OK	

Stack Static Pressure: ______

Port	Point	Time min.	Velocity Delta P	Delta H	Gas Vol. ft^3	Temp Stack °F	Temp Prb °F	Filter Box °F	Last Imp (<68˚f) °F	Aux °F	Dry Gas Meter IN	Dry Gas Meter OUT	Pump Vac Hg"
Avg sqrt dP/Avg/ or Total:													

Impinger Catch:

Imp. No.	K/O	1	2	3	4	
Final vol/wt.						
Init. vol/wt.						TOTAL
Catch						
	Knock-out	H2O	H2O	Empty	Si Gel	

Orsat Analysis

EPA Method 3

O_2	
CO_2	

Field Calculations

As = ________ ft^2

Tstd = 528 R   Pstd = 29.92 in. Hg

Ts = 460 + Tstk = ____________R

Ps = Pbar + (Pg/13.6) = ____________in. Hg

Vs = (85.49) x Cp x sqrt(Delta P) x sqrt[Ts/(Ps x MW)]

= ____________ft/sec

Qa = 60 x Vs x As = ____________ACFM

Qstd = Qa x (1-Bws) x (Tstd/Ts) x (Ps/Pstd)

= ____________DSCFM

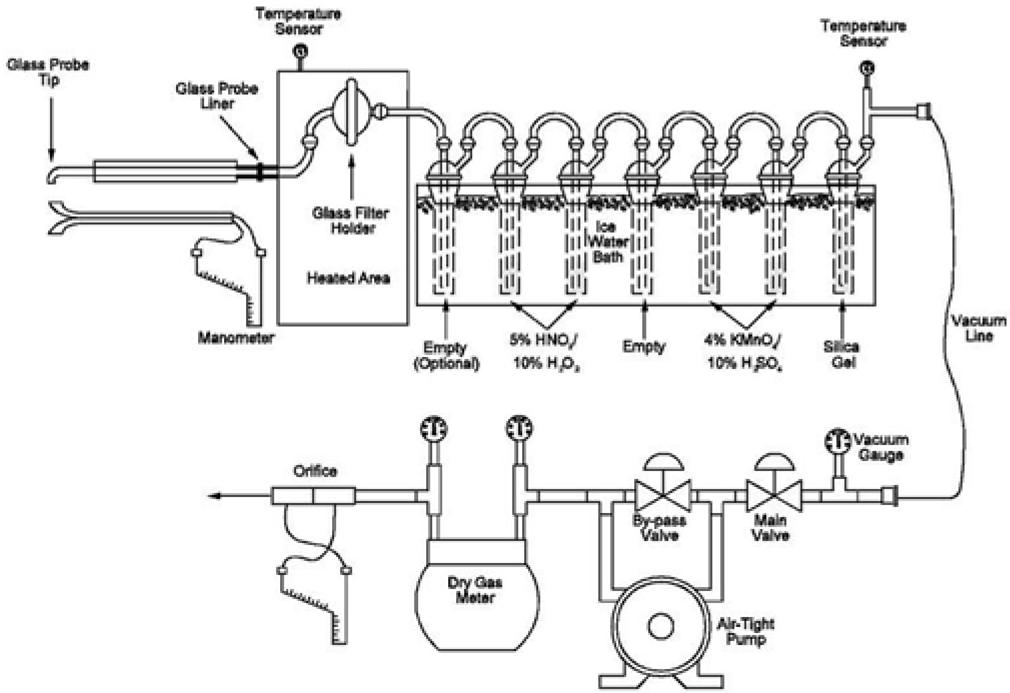
Pb = Bar. Press. -.1 per 100ft

Notes:

ATTACHMENT B

Isokinetic Sampling Train Schematics

PM/Metals Sampling Train



Dioxin/Furan Sampling Train